Measuring Systems utilising Ultra

User's Guide

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Chapter 1
Safety

Roundness

The Talyrond systems are designed to be safe when the following conditions apply:-

- The system is located indoors in dry conditions.
- Fluctuations in the mains supply voltage DO NOT exceed ±10%.
- The altitude does NOT exceed 2000m.
- The ambient temperature is between 5°C and 40°C.
- The ambient relative humidity does NOT exceed 80% for temperatures up to 31°C, decreasing linearly to 50% at 40°C.

WARNINGS:

WHEN MEASURING TALL COMPONENTS IT IS THE CUSTOMER RESPONSIBILITY TO ENSURE THAT THEY ARE SUITABLY HELD ON THE ROTATING TABLE. SELECTION OF AN INCORRECT MEASURING PROGRAM COULD CAUSE THE COMPONENT TO BE KNOCKED OVER; CAUSING POSSIBLE INJURY TO THE OPERATOR OR DAMAGE TO THE INSTRUMENT.

AXES CAN MOVE UNDER COMPUTER OR JOYSTICK CONTROL, CARE SHOULD BE TAKEN TO KEEP HANDS AWAY FROM ANY MOVING AXES, TO PREVENT INJURY TO THE USER OR DAMAGE TO THE INSTRUMENT.

ENSURE THAT THE AIR SUPPLY IS SWITCHED OFF BEFORE REMOVING A FILTER BULB.

IT IS ESSENTIAL THAT THE ELECTRICAL SUPPLY TO THIS INSTRUMENT CONSISTS OF A THREE WIRE SYSTEM IN WHICH ONE WIRE IS THE EARTH (IT MUST NEVER BE CONNECTED TO A TWO WIRE SYSTEM WITH OR WITHOUT A SEPARATE EARTH). IT IS ALSO NECESSARY THAT THE ELECTRICAL SUPPLY TO THE INSTRUMENT IS CONNECTED VIA A SEPARATE MAINS ISOLATING SWITCH AND THAT PRIOR TO CONNECTION THIS SWITCH IS SET TO THE "OFF" POSITION.

(TALYROND 265/240 and 290/280): THESE INSTRUMENTS ARE HEAVY AND UNSTABLE WHEN CARRIED. THEREFORE, IF IT IS REQUIRED TO MOVE LOCATION, THE INSTRUMENT SHOULD BE LIFTED VERTICALLY USING A FORKLIFT OR PALLET TRUCK. THE FORKS MUST BE ENGAGED FROM THE FRONT OR BACK OF THE INSTRUMENT AND BE FULLY LOCATED BELOW BOTH OF THE CROSS-MEMBERS OF THE INSTRUMENT FRAME. ENSURE THAT THE FORKS ARE WELL-SPACED (650MM MAXIMUM) AND THAT THE LENGTH OF THE FORKS IS 1 METRE MINIMUM. HAVING POSITIONED THE FORKS, CAREFULLY LIFT THE COMPLETE INSTRUMENT AND MOVE IT TO THE NEW LOCATION. TAKE CARE NOT TO DAMAGE THE SIDE PANELS WHILST MOVING THE INSTRUMENT.

(TALYROND 265XL): THE INSTRUMENT IS HEAVY AND UNSTABLE WHEN CARRIED. THE INSTRUMENT SHOULD ONLY BE LIFTED USING THE RED LIFTING BRACKET PROVIDED (TH PART S54527). THE FORK BLADES MUST BE USED IN THE POSITIONS SHOWN, ONE BLADE MUST BE CAPTIVE IN THE LIFTING

BRACKET AND THE OTHER UNDER THE CROSSMEMBER AS CLOSE TO THE REAR LEGS AS POSSIBLE.

CARE MUST BE TAKEN TO AVOID DAMAGING THE CABLES THAT EXIT THE ELECTRONICS BOX ON THE REAR OF THE INSTRUMENT, ALSO NOT TO MARK OR DAMAGE THE PAINTWORK OR INSTRUMENT. THE LIFTING BRACKET SHOULD BE SECURED TO THE INSTRUMENT WITH 6 off M10 X 25mm SCREWS SUPPLIED.

(265/265XL/240 Only): BEFORE CHANGING VOLTAGE SETTINGS OR FUSES ALWAYS ENSURE RATIONALISED INTERFACE UNIT (RIU) IS DISCONNECTED FROM MAINS SUPPLY VOLTAGE.

(290/295/280 Only): BEFORE CHANGING FUSES ALWAYS ENSURE RATIONALISED INTERFACE MODULE (RIM) IS DISCONNECTED FROM MAINS SUPPLY VOLTAGE.

(Talyrond 4/450): A PAIR OF WEIGHTS ARE ATTACHED BY CABLES TO THE INSTRUMENT CARRIAGE TO COUNTERBALANCE THE WEIGHT OF THE CARRIAGE. THERE IS A SAFETY MECHANISM THAT OPERATES TO PREVENT THE CARRIAGE MOVING IN THE EVENT THAT A CABLE SHOULD BREAK. HOWEVER IT IS VITALLY IMPORTANT THAT THESE CABLES ARE EXAMINED EVERY SIX MONTHS BY A QUALIFIED SERVICE ENGINEER AND REPLACED WHERE REQUIRED TO MAINTAIN THE SAFETY INTEGRITY OF THE SYSTEM. THIS TASK SHOULD ONLY BE ATTEMPTED BY SUITABLY QUALIFIED ENGINEERS, PREFERABLY TAYLOR HOBSON SERVICE ENGINEERS.

(Talyrond 4/450): THE EQUIPMENT WEIGHS 6.5 TONNES (14300lbs) AND APPLIES A FLOOR LOADING OF 1.5MN/m^2 (0.1tonf/in^2). THE FLOOR ON WHICH THE INSTRUMENT IS TO BE LOCATED MUST BE ABLE TO SUPPORT THE INSTRUMENT.

(Talyrond 400/440): THE EQUIPMENT WEIGHS 3.5 TONNES (7700lbs) AND APPLIES A FLOOR LOADING OF 0.5MN/m^2 (0.033tonf/in^2). THE FLOOR ON WHICH THE INSTRUMENT IS TO BE LOCATED MUST BE ABLE TO SUPPORT THE INSTRUMENT.

(Talyrond 4/450 and 400/440): THE TAYLOR HOBSON SERVICE ENGINEER ASSEMBLES THE INSTRUMENT. IT IS DELIVERED IN DISASSEMBLED FORM AND EACH OF THE COMPONENTS IS HEAVY AND UNSTABLE WHEN CARRIED. THEREFORE, IF IT IS REQUIRED TO MOVE LOCATION, THE INSTRUMENT PARTS SHOULD BE LIFTED VERTICALLY USING APPROPRIATE LIFTING EQUIPMENT. NO ATTEMPT SHOULD BE MADE TO CARRY LARGE AND HEAVY COMPONENTS BY HAND.

Caution:

Cleaning of the instrument using inappropriate cleaning materials may lead to damage being caused to the instrument. The cleaning of the instrument is to be limited to cleaning of the instrument covers and the tabletop only:

1. The covers should be cleaned using a soft cloth moistened with water or if required a mild detergent solution. No cleaning solvents or abrasive cleaners of any kind should be used on the covers as these may damage the surface of the covers.

2. The tabletop can be cleaned with a soft cloth moistened with Isopropyl Alcohol if required.

3. The arm and column is only to be cleaned by appropriately qualified persons, preferably a Taylor Hobson Service Engineer. Use of inappropriate cleaning materials can seriously degrade the performance of the instrument.

Surface

The New Form Talysurf (NFT) and Form Talysurf Intra systems are designed to be safe when the following conditions apply:-

- The system is located indoors in dry conditions.
- Fluctuations in the mains supply voltage DO NOT exceed ±10%.
- The altitude does NOT exceed 2000m.
- The ambient temperature is between 10°C and 35°C (NFT Inductive system), 18^{o}C and 28^{o}C (NFT PGI system) and 15°C and 35°C (Intra system).

- The ambient relative humidity does NOT exceed 80% for temperatures up to 31°C, decreasing linearly to 50% at 40°C.

Laser Safety

The FTS PGI System option contains a laser as part of the system. The following information MUST BE noted before installing the instrument.

PGI Gauge

Under normal operating conditions the PGI gauge, which houses a 1mW max. laser diode, conforms to Class 1 laser product specifications, as defined in;

- British Standard: EN 60825-1: 1994 (+A11, +A1, +A2)
- DHHS REGULATION 21, CFR ch. 1
- U.S. Standard: F.D.A. Laser Performance Standard 21 CFR 1040.10 and 1040.11.

The PGI gauge meets the requirements of a Class 1 laser product- when operating normally in conjunction with the associated hardware and computer software supplied. Any variation of this configuration may affect the hazard of the laser.

The front main cover of the gauge carries a Caution label.

Warning specific to Laser

The Laser assembly should never be dismantled under any circumstances. Laser Assembly conforms to Class 2 classification when in assembled state.

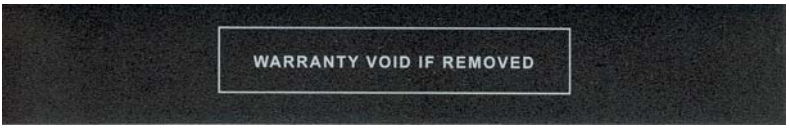
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Embedded Laser Specification

Wavelength: 670nm @25^{o}C

Max power: <1mW (laser)

PGI Warranty label



Caution

The PGI Gauge contains no user Servicable Parts. No attempt is to be made to dismantle or remove the covers of the gauge in the unlikely event that it fails. In order to access the gauge the above label has to be removed and removal of the label will invalidate the Warranty on the Gauge.

Warnings (FTS and FTS Intra)

The following must be observed:-

- **Before operating this instrument, the operator should be familiar with this handbook and the contents of the "On-Line" Help facility within the "μltra" Software, and understand the operation of the instrument.**
- **It is essential that the electrical supply to this instrument consists of a THREE WIRE SYSTEM in which one wire is the earth. The instrument must NEVER be connected to a two wire system with, or without, a separate earth.**
- **The electrical supply to the instrument should be CONNECTED VIA A SEPARATE MAINS ISOLATING SWITCH and that prior to connection this switch is set to the "OFF" position.**
- **The mains power lead MUST BE DISCONNECTED before making any system interconnections, attempting to change a gauge, attempting to change boards or attempting to change a fuse.**
- **KEEP CLEAR OF THE INSTRUMENT DURING OPERATION. This is both good metrology practice and will avoid the risk of injury caused by contact with moving components of the system.**
- **The instrument can be operated under the control of a computer program and can, therefore, move without warning. KEEP CLEAR OF THE INSTRUMENT WHEN IT IS OPERATING IN THIS MODE.**
- **The FTS Intra base and column, together, are heavy items. Exercise caution when moving and where necessary use mechanical lifting equipment.**
- **The FTS Intra base and column, together, are heavy items. If the column and base are being used, the table used to support them must be capable of safely supporting this weight plus any other accessories.**

- **The column is a heavy item. DO NOT attempt to lift the column by the leadscrew or the handwheel if fitted.**
- **DO NOT leave a column standing in the vertical position if it has not been bolted into place.**
- **Before placing the traverse unit on the carriage adaptor plate, ensure that the adaptor plate is firmly secured to the column carriage.**
- **The column and the base are very heavy items, exercise extreme caution when moving either of them.**
- **112/3311-01 ENVIRONMENTAL COVER. When moving this cover the lifting handles must be used. Fingers must at no time be between the frame and sliding doors as this can result in serious injury.**

Anti-Vibration Mounting System Warning

When using the Anti-Vibration Mounting System:

- **Only inflate using the pump provided.**
- **The anti-vibration mountings must only be inflated to provide a lift of 7mm.**
- **The maximum permitted inflation pressure is 7bar. Under normal loading of the Instrument base, inflation pressures of only 3 bar are sufficient to provide the required 7mm lift.**
- **Always fully deflate the mountings before attempting to move the system.**

Chapter 2
System Requirements

Roundness

The following data relates to the instrument system, for details of computer, printer etc., please refer to manufacturer's documentation.

Weight

Talyrond 130 *(and Talyrond 115)*
38kg (85lbs)

Talyrond 131
62kg (136lbs)

Talyrond 265 *(and Talyrond 240***)**
276kg (610lbs)

Talyrond 265XL
450kg (990lbs)

Talyrond 290 *(and Taylrond 280)*
350kg (773.5lbs)

Talyrond 295
556kg (1220lbs)
134kg (295lbs) -environmental cabinet weight

Talyrond 73
381kg (840lbs)

Talyrond 4/450
6.5 tonnes (14300lbs). The instrument exerts a floor loading of 1.5MN/m^2 (0.1tonf/in^2). The floor on which the instrument is to be located must be able to support the instrument.

Talyrond 400/440
3.5 tonnes (7700lbs). The instrument exerts a floor loading of 0.5MN/m^2 (0.033tonf/in^2). The floor on which the instrument is to be located must be able to support the instrument

Electrical Supply.

Type: Alternating supply, single phase with earth (3 wire system)

Frequency: 47 - 63 Hz.

Talyrond 130/115
Power Supply Unit external to instrument. Voltage: 100 - 240V
Consumption: 250VA maximum

Talyrond 131
Power Supply Unit external to instrument. Voltage: 100 - 240V
Consumption: 250VA maximum

Talyrond 265/240/265XL
Voltage: 100 - 130V or 200 - 240V (switch Selectable)
Consumption: 500VA maximum

Talyrond 290/280
Voltage: 100 - 240V
Consumption: 500VA maximum

Talyrond 295
Voltage: 100 - 240V
Consumption: 500VA maximum + 50VA maximum for AVI control unit

Talyrond 73
Voltage: 110/120/220/240V
Consumption: 30VA (Instrument), 75VA (RIU)

Talyrond 4/450
Voltage: 100 - 240V
Consumption: 2500VA maximum

Talyrond 400/440
Voltage: 100 - 240V
Consumption: 2200VA maximum

Hydraulics (Talyrond 4/450 and 400/440)

Talyrond 4/450/400/440
The instrument requires 20 litres of Mobil Velocite No. 6 oil, Taylor Hobson part Number 8101/29123.

Air Supply - To Spindle

Talyrond 130/115/131

Supply pressure:	80 - 125 lbf/in^2 (5.52 to 8.62 bar)
Operating pressure:	60 lbf/in^2 (4.1 bar)
Moisture Content Dew Point:	2^{o}C (35^{o}F)
Max Oil Content:	1mg/m^3
Max solid particle Content:	5mg/m^3
Filtration:	5mm
Air consumption:	0.5 to 0.71 l/s

Talyrond 265/240/290/280/295

Air Pressure:	550-1030 kPa (5.5-10.3 bar)
Regulator (Pre-Set):	350 kpa (3.5 bar)
Filter:	5 micron
Moisture content - dew point:	-20°C
Flow Rate Required at operating Pressure:	150litres/min(minimum)
Max oil content:	25 mg / cubic m
Solid Particle Content:	5mg / cubic m

Oil Supply

Oil supply - Spindle (Talyrond 73 only)

Syringe Tube and Spindle Oil:	Taylor Hobson Part No. B112/2562

Environmental Conditions

Operating Temperature:	10°C to 35°C
Storage Temperature:	-10°C to 50°C
Temperature Gradient:	<2°C per hour
Operating Humidity:	30 to 80% relative humidity - non condensing
Storage Humidity:	10 to 90% relative humidity - non condensing
Free Air Flow Rate:	1.0m/sec maximum, steady
Maximum Transmitted Vibrations:	0.05mm/s (<50Hz) (0.0019in/sec at <50Hz, 0.1mm/s (>50Hz) (0.0039in/sec at >50Hz)

Surface - New Form Talysurf

Electrical Supply

Mains supply voltage: 90 to 240VAC

Frequency: 50/60 Hz

Power Consumption: 500 VA Maximum

This equipment is intended for installation category (low-voltage category) II, in accordance with EN 61010-1 (2001).

Note: For details of the power requirements for the computer and any accessories that do no derive their power from the Electronic Interface Module, refer to the manufacturer's documentation.

Environmental Conditions

For operation within performance specifications,

Ambient temperature range:10°C to 35°C Inductive system
18°C to 28°C PGI system

Ambient relative humidity: 30% to 80%

Surface - Form Talysurf Intra

Electrical Supply

Mains supply voltage: 90V-130V or 200V-260V

Frequency: 50/60 Hz

Power Consumption: 30 VA Maximum

This equipment is intended for installation category (over-voltage category) II, in accordance with IEC 1010 (1990) and EN 61010-1 (1993).

Note: For details of the power requirements for the computer and any accessories that do no derive their power from the Electronic Interface Module, refer to the manufacturer's documentation.

Environmental Conditions

For operation within performance specifications,

Ambient temperature range: 15°C to 35°C

Ambient relative humidity: 10% to 80%

Chapter 3
Installation Instructions for the Talyrond Roundness instruments

Introduction

All Talyrond instruments are initially installed by a representative of Taylor Hobson Limited. However, certain instruments, ie Talyrond 130/115, 131, 265/240, 265XL, 290/280 and 295 can be subsequently moved and re-installed by the user. This must be done with care for the instrument and consideration for its applications and location. Sufficient information for this purpose is provided in this Chapter.

Subsequent moving and re-installation of Talyrond 73, 4/450 and 400/440 instruments may be carried out but it is recommended that the user should consult the Taylor Hobson Service Department for advice.

Having completed the system installation, all details of the basic operation of the "μltra" Software are obtained by reference to the software "On-Line" Help facility. In case of any queries or problems Taylor Hobson Limited can be contacted at the addresses shown at the back of this handbook.

Please retain this handbook for future reference.

General

Unpacking the Instrument

Initial installation is carried out by a service engineer, or a representative, of Taylor Hobson Limited. PLEASE DO NOT

UNPACK YOUR INSTRUMENT, OR ASSOCIATED PRODUCTS, UNLESS WITH PRIOR AGREEMENT WITH A SERVICE ENGINEER OR REPRESENTATIVE OF TAYLOR HOBSON LIMITED.

Siting the instrument

The overall accuracy of measurement results will be influenced by environmental conditions, particularly; draughts, vibration and the rate at which the ambient temperature changes. The choice of location depends on the application requirement. However, to ensure that the optimum performance is achieved, wherever possible, the instrument hardware should be installed with consideration given to the surroundings in which it will operate.

The following items must be considered when siting the instrument:

Draughts

Draughts and airborne vibration should be avoided particularly when measuring in the skidless mode. Avoid placing the instrument in draughts or directly under air conditioning vents.

Temperature Gradients

Avoid siting the instrument in areas that have a very rapid temperature gradient, as in the case of being near windows or skylights where sunlight may fall on the instrument.

Areas that experience temperature gradients of over 2°C/hour are not ideal for the measurement of precise form.

Vibration

Vibration is particularly detrimental for high precision measurements. All Talyrond instruments are supplied with appropriate frame and anti-vibration mounts.

Power Supply

It is important that a clean power supply should be provided to the instrument. If in doubt, many computer peripheral dealers can supply a suitable Uninterruptible Power Supply (U.P.S.).

WARNING. A GOOD EARTH POINT IS ESSENTIAL FOR BOTH SAFETY AND THE CORRECT OPERATION OF THE INSTRUMENT.

Talyrond 130/115

Siting

Cautions

1. Do not use the instrument worktable to lift the base unit out of the shipping crate.

2. To avoid damage to the precision rotary spindle parts, DO NOT rotate the worktable until the instrument is connected to the air line and the correct air pressure is applied. The weight of the worktable is usually sufficient to prevent rotation when pressurised air is not present.

This equipment is designed to be located indoors in dry conditions. It is to be located on a suitable level workbench that is placed on a level, vibration-free floor.

Caution.

The workbench must be strong enough to support 140kg (300lbs).

For optimum performance, there should be no draughts, and a uniform temperature between floor and ceiling. The instrument should not be placed in direct sunlight. For best results the instrument should be operated in a room with stabilised temperature control.

Installation and Configuration

Note:

There are no column or spindle transit bolts fitted to the Talyrond 130/115.

Levelling the Instruments

Level the base unit by adjusting the four levelling feet, ensuring that the feet all remain in contact with the worktable or bench surface.

If high accuracy roundness measurements are to be made, then the instrument must be level. Such roundness measurements taken without proper levelling will contain an elliptical component. Use a spirit level on the homed C&L table surface and check that the instrument is level to within 0.1mm/m in both planes by careful fine adjustment of the four adjustable feet, levelling may need refining after being allowed to settle for 24 hours.

Connecting Up

Mains Supply / Voltage Selector. Connect a suitable plug to the mains lead, wired as follows:

- Brown to Live
- Blue to Neutral
- Yellow/Green to Earth

WARNING:

IT IS ESSENTIAL THAT THE ELECTRICAL SUPPLY TO THIS INSTRUMENT CONSISTS OF A THREE WIRE SYSTEM IN WHICH ONE WIRE IS THE EARTH (IT MUST NEVER BE CONNECTED TO A TWO WIRE SYSTEM WITH OR WITHOUT A SEPARATE EARTH). IT IS ALSO NECESSARY THAT THE ELECTRICAL SUPPLY TO THE

INSTRUMENT IS CONNECTED VIA A SEPARATE MAINS ISOLATING SWITCH AND THAT PRIOR TO CONNECTION THIS SWITCH IS SET TO THE "OFF" POSITION.

Connection of Air Supply. It is essential that the air supply is connected before the instrument is switched on. The air line is connected to the pneumatic assembly, located at the rear of the instrument base.

Connection of All Leads. There are a number of leads, which connect the instrument and the computer. These are shown in the following schematic views. When fully connected up, the system can be switched on.

WARNING:

AFTER CONNECTING LEADS TO THE SYSTEM ALWAYS BE AWARE THAT THE INSTRUMENT COULD MOVE UNEXPECTEDLY IF AN INCORRECT CONNECTION HAS BEEN MADE.

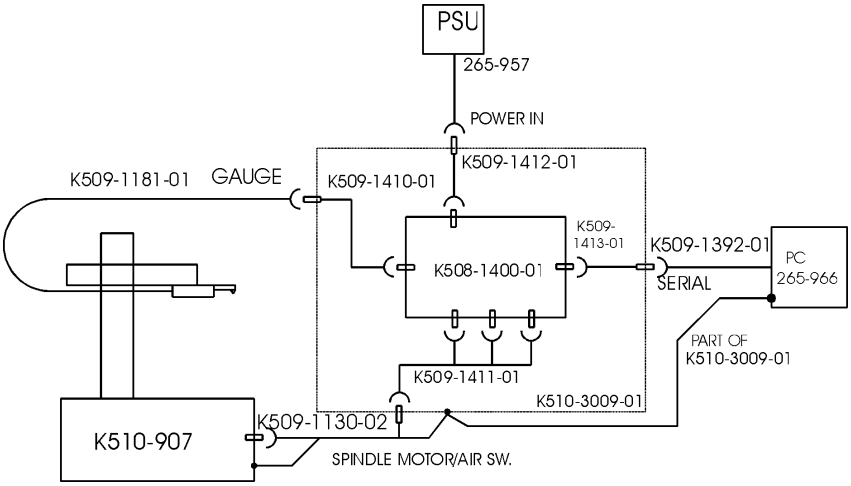
Caution:

Always remove the power from the system before disconnecting or reconnecting leads

WARNING:

THE FUSES MUST ONLY BE REPLACED BY AUTHORISED AND COMPETENT PERSONNEL. THE MAINS LEAD MUST NOT BE RECONNECTED UNTIL THE

FUSEHOLDER HAS BEEN REPLACED. ALWAYS REPLACE COVER AFTER CHANGING FUSES.



Fuses. The main fuses are located in the plugs for the Power Supply and the PC. Check that the fuses correspond to the following:

PC. 5A mains fuse

Power Supply. 2A mains fuse

Talyrond 131

Siting

WARNING (TALYROND 131 ONLY)

FOUR HANDLES ARE PROVIDED FOR LIFTING THE BASE, WHICH WEIGHS 41KG (90LBS). THESE HANDLES MUST BE FULLY SCREWED INTO THE THREADED HOLES IN THE ENDS OF THE BASE (TWO HANDLES AT EACH END). THE USER MUST DECIDE WHETHER TO USE MANUAL OR MECHANICAL LIFTING DEPENDING ON THE ENVIRONMENT AND THE DISTANCE TO BE MOVED.

Cautions

1. Do not use the instrument worktable to lift the base unit out of the shipping crate.

2. To avoid damage to the precision rotary spindle parts, DO NOT rotate the worktable until the instrument is connected to the air line and the correct air pressure is applied. The weight of the worktable is usually sufficient to prevent rotation when pressurised air is not present.

This equipment is designed to be located indoors in dry conditions. It is to be located on a suitable level workbench that is placed on a level, vibration-free floor.

Caution.

The workbench must be strong enough to support 140kg (300lbs).

For optimum performance, there should be no draughts, and a uniform temperature between floor and ceiling. The instrument should not be placed in direct sunlight. For best results the instrument should be operated in a room with stabilised temperature control.

Installation and Configuration

Note:

The Talyrond 131 is fitted with column transit bolts but has no spindle transit bolts.

Column Transit Bolts.

To prevent movement during transit, the column balance weight (which is housed inside of the column) is clamped into position by two red painted screws. These screws are fitted through tapped holes in the sides of the column and must be removed before operation, or damage to the instrument will occur. Retain the bolts for future use. If the instrument is to be moved to a new location, the column balance weight must be clamped during transit.

Removal of Transit Bolts: Remove both bolts and store in a safe location.

Refitting of Transit Bolts: Drive the column carriage to a position approximately 25mm (1inch) above the clamping screw holes in the sides of the column. Loosely fit the balance weight clamping screws into the holes, screwing them in until they are engaged with the column but are clear of the balance weight. Drive the column carriage down until it just rests on the heads of the screws.

The balance weight will now be positioned between the locking screws. Tighten the screws to lock the balance weight in position.

Levelling the Instruments

Level the base unit by adjusting the four levelling feet, ensuring that the feet all remain in contact with the worktable or bench surface.

If high accuracy roundness measurements are to be made, then the instrument must be level. Such roundness measurements taken without proper levelling will contain an elliptical component. Use a spirit level on the homed C&L table surface and check that the instrument is level to within 0.1mm/m in both planes by careful fine adjustment of the four adjustable feet, levelling may need refining after being allowed to settle for 24 hours.

Connecting Up

Mains Supply / Voltage Selector. Connect a suitable plug to the mains lead, wired as follows:

- Brown to Live
- Blue to Neutral
- Yellow/Green to Earth

WARNING:

IT IS ESSENTIAL THAT THE ELECTRICAL SUPPLY TO THIS INSTRUMENT CONSISTS OF A THREE WIRE SYSTEM IN WHICH ONE WIRE IS THE EARTH (IT MUST NEVER BE CONNECTED TO A TWO WIRE SYSTEM WITH OR WITHOUT A SEPARATE EARTH). IT IS ALSO NECESSARY THAT THE ELECTRICAL SUPPLY TO THE

INSTRUMENT IS CONNECTED VIA A SEPARATE MAINS ISOLATING SWITCH AND THAT PRIOR TO CONNECTION THIS SWITCH IS SET TO THE "OFF" POSITION.

Connection of Air Supply. It is essential that the air supply is connected before the instrument is switched on. The air line is connected to the pneumatic assembly, located at the rear of the instrument base.

Connection of All Leads. There are a number of leads, which connect the instrument and the computer. These are shown in the following schematic views. When fully connected up, the system can be switched on.

WARNING:

AFTER CONNECTING LEADS TO THE SYSTEM ALWAYS BE AWARE THAT THE INSTRUMENT COULD MOVE UNEXPECTEDLY IF AN INCORRECT CONNECTION HAS BEEN MADE.

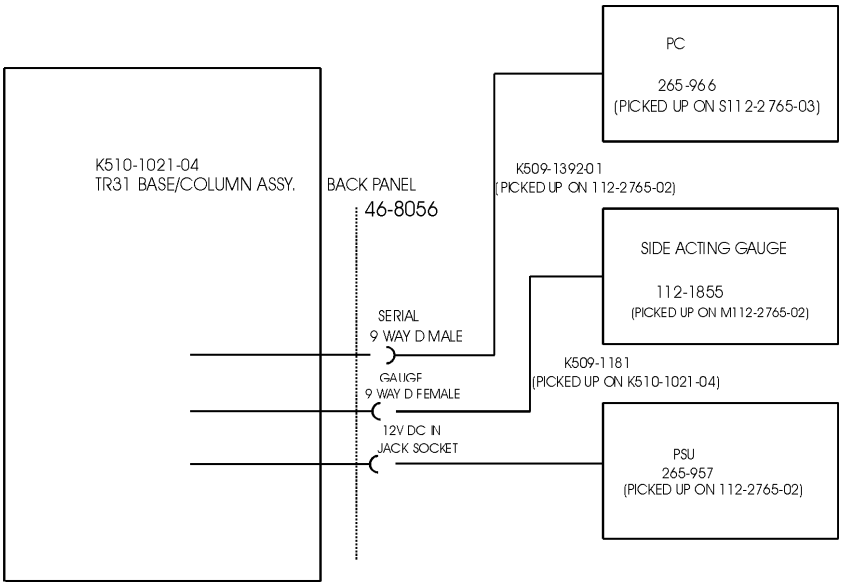
Caution:

Always remove the power from the system before disconnecting or reconnecting leads

WARNING:

THE FUSES MUST ONLY BE REPLACED BY AUTHORISED AND COMPETENT PERSONNEL. THE MAINS LEAD MUST NOT BE RECONNECTED UNTIL THE

FUSEHOLDER HAS BEEN REPLACED. ALWAYS REPLACE COVER AFTER CHANGING FUSES.



Fuses (Talyrond 131). The main fuses are located in the plugs for the Power Supply and the PC. Check that the fuses correspond to the following:

PC. 5A mains fuse

Power Supply. 2A mains fuse

Talyrond 265/240/265XL

Siting

This equipment is designed to be located indoors in dry conditions and placed on a level, vibration-free floor. For optimum performance, there should be no draughts, and a uniform temperature between floor and ceiling. The instrument should not be placed in direct sunlight. For best results the instrument should be operated in a room with stabilised temperature control.

WARNING:

THIS INSTRUMENT IS HEAVY AND UNSTABLE WHEN CARRIED. THEREFORE, IF IT IS REQUIRED TO MOVE LOCATION, THE INSTRUMENT SHOULD BE LIFTED VERTICALLY USING A FORKLIFT OR PALLET TRUCK. THE FORKS MUST BE ENGAGED FROM THE FRONT OR BACK OF THE INSTRUMENT AND BE FULLY LOCATED BELOW BOTH OF THE CROSS-MEMBERS OF THE INSTRUMENT FRAME. ENSURE THAT THE FORKS ARE WELL-SPACED (650MM MAXIMUM) AND THAT THE LENGTH OF THE FORKS IS 1 METRE MINIMUM. HAVING POSITIONED THE FORKS, CAREFULLY LIFT THE COMPLETE INSTRUMENT AND MOVE IT TO THE NEW LOCATION. TAKE CARE NOT TO DAMAGE

THE SIDE PANELS WHILST MOVING THE INSTRUMENT.

WARNING 265XL:

THE INSTRUMENT IS HEAVY AND UNSTABLE WHEN CARRIED. THE INSTRUMENT SHOULD ONLY BE LIFTED USING THE RED LIFTING BRACKET PROVIDED (TH PART S54527). THE FORK BLADES MUST BE USED IN THE POSITIONS SHOWN, ONE BLADE MUST BE CAPTIVE IN THE LIFTING BRACKET AND THE OTHER UNDER THE CROSSMEMBER AS CLOSE TO THE REAR LEGS AS POSSIBLE. CARE MUST BE TAKEN TO AVOID DAMAGING THE CABLES THAT EXIT THE ELECTRONICS BOX ON THE REAR OF THE INSTRU-

MENT, ALSO NOT TO MARK OR DAMAGE THE PAINT-WORK OR INSTRUMENT.

THE LIFTING BRACKET SHOULD BE SECURED TO THE INSTRUMENT WITH 6 off M10 X 25mm SCREWS SUPPLIED.

THE OPERATORS MUST ADHERE TO THE LOCAL IN FORCE REGULATIONS REGARDING LIFTING AND HANDLING OF HEAVY ITEMS

APPROX WEIGHT OF INSTRUMENT : 450kg

APPROX WEIGHT OF LIFTING BRACKET: 30kg

With the instrument in place the lifting bracket can be removed and the lifting wedge cover fitted using the 6 off M4 x 10mm

Installation and Configuration

Column Transit Bolts.

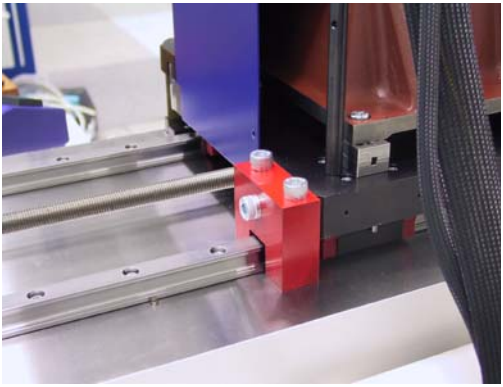
To prevent movement during transit, the column balance weight (which is housed inside of the column) is clamped into position by two red painted screws. These screws are fitted through tapped holes in the sides of the column and must be removed before operation, or damage to the instrument will occur. Retain the bolts for future use. If the instrument is to be moved to a new location, the column balance weight must be clamped during transit.

Removal of Transit Bolts: Remove both bolts and store in a safe location.

Refitting of Transit Bolts: Drive the column carriage to a position approximately 25mm (1inch) above the clamping screw holes in the sides of the column. Loosely fit the balance weight clamping screws into the holes, screwing them in until they are engaged with the column but are clear of the balance weight. Drive the column carriage down until it just rests on the heads of the screws. The balance weight will now be positioned between the locking screws. Tighten the screws to lock the balance weight in position.

Transit Items (265XL only).

Carriage transit block. The column carriage is secured during transit with a transit block as shown.



This must be removed before the instrument is used. To do this remove the 3 off M10 screws. It's recommended that the block be stored somewhere safe for future use. Once the stop block has been removed the carriage rear cover can be refitted using the 8 off M4 x 10mm flange button head screws supplied. Care must be taken when fitting the cover to make sure that the column motor cable fits into the slot provided and is secured with the grommet supplied. The leadscrew handle (supplied) can be fitted to the end of the leadscrew.

Spindle Transit Bolt.

WARNING:

THE INSTRUMENT WORKTABLE MUST NEVER BE ROTATED IF THE AIR SUPPLY IS SWITCHED OFF, DISCONNECTED, OR SET TO THE WRONG PRESSURE. ENSURE THAT THE AIR SUPPLY IS SWITCHED OFF BEFORE REMOVING A FILTER BULB.

Caution:

To prevent any damage to the spindle during movement, the spindle is rigidly clamped using a special transit bolt. Failure to use this bolt during transit could result in serious damage.

Removal of Transit Bolt: Remove the red-painted transit bolt and re-fit the access plate (located on the top of the transit bolt). Store the transit bolt safely for further use.

Refitting of Transit Bolt: Remove the access plate in the centre of the Centre and Levelling (C&L) table. Fit the red-painted transit bolt and store the access plate on the top of the transit bolt.

Levelling the Instruments

Level the base unit by adjusting the four levelling feet, ensuring that the feet all remain in contact with the worktable or bench surface.

If high accuracy roundness measurements are to be made, then the instrument must be level. Such roundness measurements taken without proper levelling will contain an elliptical component. Use

a spirit level on the homed C&L table surface and check that the instrument is level to within 0.1mm/m in both planes by careful fine adjustment of the four adjustable feet, levelling may need refining after being allowed to settle for 24 hours.

Talyrond 265XL. The instrument can be levelled by adjusting the 3 levelling feet in the frame. The levelling feet are accessed by removing the access covers.

Connecting Up

Mains Supply / Voltage Selector. Connect a suitable plug to the mains lead, wired as follows:

- Brown to Live
- Blue to Neutral
- Yellow/Green to Earth

WARNING:

IT IS ESSENTIAL THAT THE ELECTRICAL SUPPLY TO THIS INSTRUMENT CONSISTS OF A THREE WIRE SYSTEM IN WHICH ONE WIRE IS THE EARTH (IT MUST NEVER BE CONNECTED TO A TWO WIRE SYSTEM WITH OR WITHOUT A SEPARATE EARTH). IT IS ALSO NECESSARY THAT THE ELECTRICAL SUPPLY TO THE INSTRUMENT IS CONNECTED VIA A SEPARATE MAINS ISOLATING SWITCH AND THAT PRIOR TO CONNECTION THIS SWITCH IS SET TO THE "OFF" POSITION.

Voltage Selector. Check that the voltage selector, on the back panel of the Rationalised Interface Unit (RIU) is set to the appropriate voltage.

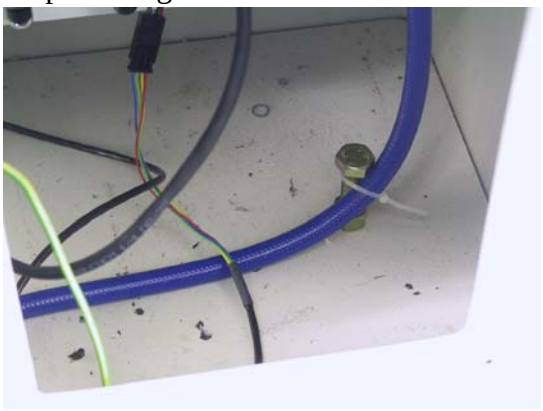
Caution:

Before changing voltage, always ensure instrument is disconnected from the mains supply.

Connection of Air Supply.

Talyrond 265/240. It is essential that the air supply is connected before the instrument is switched on. The air line is connected to the rear of the pneumatic assembly, located at the front of the instrument (remove front cover). Route the air line through the holes in the base plate of the frame, inside the main legs. Ensure that there is no leakage from the connection. Slide the red sleeve valve towards the front of the instrument to switch it on.

Talyrond 265XL. Feed the air line in through the 'AIR IN' hole located on the inside face of the spindle leg. Connect to the pneumatic panel, accessed by removing the pneumatic panel cover on the rear of the spindle leg.



Caution:

It is essential that the air in line is constrained inside of the spindle leg. It must be secured to the screw for the front AV mount using a cable tie (supplied).

Connection of All Leads. There are a number of leads, which connect the instrument and the computer. These are shown in the following schematic views. When fully connected up, the system can be switched on.

WARNING:

AFTER CONNECTING LEADS TO THE SYSTEM ALWAYS BE AWARE THAT THE INSTRUMENT COULD MOVE UNEXPECTEDLY IF AN INCORRECT CONNECTION HAS BEEN MADE.

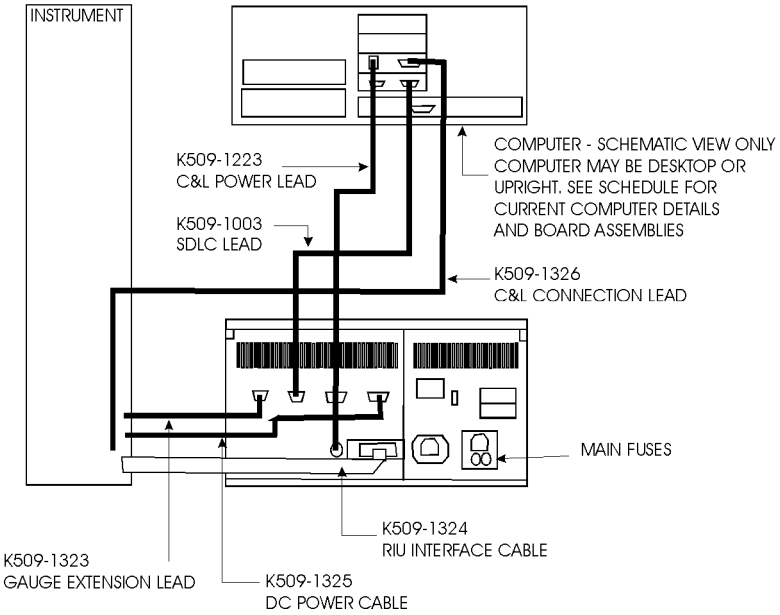
Caution:

Always remove the power from the system before disconnecting or reconnecting leads

WARNING:

THE FUSES MUST ONLY BE REPLACED BY AUTHORISED AND COMPETENT PERSONNEL. THE MAINS LEAD MUST NOT BE RECONNECTED UNTIL THE

FUSEHOLDER HAS BEEN REPLACED. ALWAYS REPLACE COVER AFTER CHANGING FUSES.



Fuses (Talyrond 265/240/265XL). The main fuses are located as shown in the connection diagram. Check that the two fuses correspond to the following:

T1A 20mm (Anti-Surge)

Talyrond 265XL.

- **Joystick.** Connect the joystick lead to the d-type socket on the instrument, below the Leadscrew handle. Connect the other

end to the d-type socket on the back of the remote joystick box.

Caution:

The joystick MUST be connected before turning on the instrument. The joystick should be positioned in a suitable place so that it cannot be knocked by the rotating component.

Talrond 290/280/295

Siting

This equipment is designed to be located indoors in dry conditions and placed on a level, vibration-free floor. For optimum performance, there should be no draughts, and a uniform temperature between floor and ceiling. The instrument should not be placed in direct sunlight. For best results the instrument should be operated in a room with stabilised temperature control.

WARNING:

THIS INSTRUMENT IS HEAVY AND UNSTABLE WHEN CARRIED. THEREFORE, IF IT IS REQUIRED TO MOVE LOCATION, THE INSTRUMENT SHOULD BE LIFTED VERTICALLY USING A FORKLIFT OR PALLET TRUCK. THE FORKS MUST BE ENGAGED FROM THE FRONT OR BACK OF THE INSTRUMENT AND BE FULLY LOCATED BELOW BOTH OF THE CROSS-MEMBERS OF THE INSTRUMENT FRAME. ENSURE THAT THE FORKS ARE WELL-SPACED (650MM MAXIMUM) AND THAT THE LENGTH OF THE FORKS IS 1 METRE MINIMUM. HAVING POSITIONED THE FORKS, CAREFULLY LIFT THE COMPLETE INSTRUMENT AND MOVE IT TO THE NEW LOCATION. TAKE CARE NOT TO DAMAGE

THE SIDE PANELS WHILST MOVING THE INSTRUMENT.

Installation and Configuration

Note:

The Talyrond 295 is installed and configured by a taylor Hobson Service Engineer. In the event of the instrument needing to be moved, please contact the Service department at Taylor Hobson.

Column Transit Bolts.

To prevent movement during transit, the column balance weight (which is housed inside of the column) is clamped into position by two red painted bolts. These bolts are fitted through tapped holes in the sides of the column and must be removed before operation, or damage to the instrument will occur. On later instruments (shipped after 2000) there are a further two red painted retaining bolts positioned above the carriage to secure the carriage in place. Retain all bolts for future use. If the instrument is to be moved to a

new location, the column balance weight must be clamped during transit.

Removal of Transit Bolts: Remove all bolts and store in a safe location.

Refitting of Transit Bolts: Drive the column carriage to a position approximately 325mm as indicated on the scale. Loosely fit the balance weight clamping screws into the holes, screwing them in until they are engaged with the column but are clear of the balance weight. Drive the column carriage down until it just rests on the heads of the screws. The balance weight will now be positioned between the locking screws. Tighten the screws to lock the balance weight in position. On later versions of the column (shipped after 2000) fit the additional two transit bolts in place above the carriage to secure the carriage during transit.

Spindle Transit Bolt .

WARNING:

THE INSTRUMENT WORKTABLE MUST NEVER BE ROTATED IF THE AIR SUPPLY IS SWITCHED OFF, DISCONNECTED, OR SET TO THE WRONG PRESSURE. ENSURE THAT THE AIR SUPPLY IS SWITCHED OFF BEFORE REMOVING A FILTER BULB.

Caution:

To prevent any damage to the spindle during movement, the spindle is rigidly clamped using a special transit bolt. Failure to use this bolt during transit could result in serious damage.

Removal of Transit Bolt: Remove the red-painted transit bolt and re-fit the access plate (located on the top of the transit bolt). Store the transit bolt safely for further use.

Refitting of Transit Bolt: Remove the access plate in the centre of the Centre and Levelling (C&L) table. Fit the red-painted transit bolt and store the access plate on the top of the transit bolt.

Levelling the Instruments

Level the base unit by adjusting the four levelling feet, ensuring that the feet all remain in contact with the worktable or bench surface.

If high accuracy roundness measurements are to be made, then the instrument must be level. Such roundness measurements taken without proper levelling will contain an elliptical component. Use a spirit level on the homed C&L table surface and check that the instrument is level to within 0.1mm/m in both planes by careful fine adjustment of the four adjustable feet, levelling may need refining after being allowed to settle for 24 hours.

Connecting Up

Mains Supply / Voltage Selector. Connect a suitable plug to the mains lead, wired as follows:

- Brown to Live
- Blue to Neutral
- Yellow/Green to Earth

WARNING:

IT IS ESSENTIAL THAT THE ELECTRICAL SUPPLY TO THIS INSTRUMENT CONSISTS OF A THREE WIRE SYSTEM IN WHICH ONE WIRE IS THE EARTH (IT MUST NEVER BE CONNECTED TO A TWO WIRE SYSTEM WITH OR WITHOUT A SEPARATE EARTH). IT IS ALSO NECESSARY THAT THE ELECTRICAL SUPPLY TO THE INSTRUMENT IS CONNECTED VIA A SEPARATE MAINS ISOLATING SWITCH AND THAT PRIOR TO CONNECTION THIS SWITCH IS SET TO THE "OFF" POSITION.

Connection of Air Supply. It is essential that the air supply is connected before the instrument is switched on. The air line is connected to the rear of the pneumatic assembly, located at the front of the instrument (remove front cover). Route the air line through the holes in the base plate of the frame, inside the main legs. Ensure that there is no leakage from the connection. Slide the red sleeve valve towards the front of the instrument to switch it on.

Connection of All Leads. There are a number of leads, which connect the instrument and the computer. These are shown in the following schematic views. When fully connected up, the system can be switched on.

WARNING:

AFTER CONNECTING LEADS TO THE SYSTEM ALWAYS BE AWARE THAT THE INSTRUMENT COULD MOVE UNEXPECTEDLY IF AN INCORRECT CONNECTION HAS BEEN MADE.

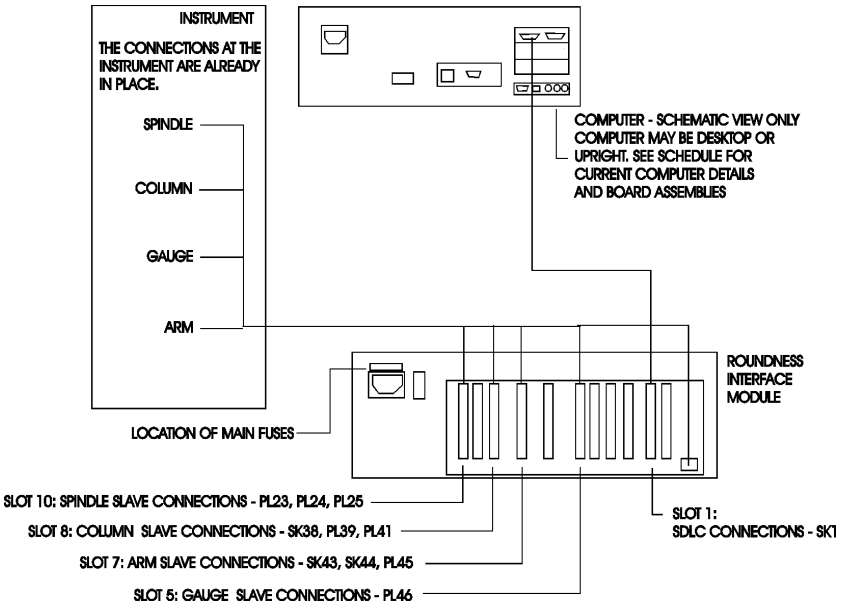
Caution:

Always remove the power from the system before disconnecting or reconnecting leads

Instrument/PC/RIM Connections

WARNING:

THE FUSES MUST ONLY BE REPLACED BY AUTHORISED AND COMPETENT PERSONNEL. THE MAINS LEAD MUST NOT BE RECONNECTED UNTIL THE FUSEHOLDER HAS BEEN REPLACED. ALWAYS REPLACE COVER AFTER CHANGING FUSES.


INSTRUMENT
THE CONNECTIONS AT THE INSTRUMENT ARE ALREADY IN PLACE.
SPINDLE
COLUMN
GAUGE
ARM
COMPUTER - SCHEMATIC VIEW ONLY
COMPUTER MAY BE DESKTOP OR UPRIGHT. SEE SCHEDULE FOR CURRENT COMPUTER DETAILS AND BOARD ASSEMBLIES
ROUNDNESS INTERFACE MODULE
LOCATION OF MAIN FUSES
SLOT 10: SPINDLE SLAVE CONNECTIONS - PL23, PL24, PL25
SLOT 8: COLUMN SLAVE CONNECTIONS - SK38, PL39, PL41
SLOT 7: ARM SLAVE CONNECTIONS - SK43, SK44, PL45
SLOT 5: GAUGE SLAVE CONNECTIONS - PL46
SLOT 1:
SDLC CONNECTIONS - SK1

Fuses. The two main fuses (6.3A, 250V fast acting, HBC, 5x20mm ceramic sand filled) are located above the mains lead as shown in the interconnection diagram. To access the fuses, remove the cover over the fuseholder and remove the mains lead. The fuseholder can now be removed by pressing the catch under the holder upwards and sliding the unit out.

Talyrond 73

Siting

This equipment is designed to be located indoors in dry conditions and placed on a level, vibration-free floor. For optimum performance, there should be no draughts, and a uniform temperature between floor and ceiling. The instrument should not be placed in direct sunlight. For best results the instrument should be operated in a room with stabilised temperature control.

Subsequent moving and re-installation may be carried out but it is recommended that the user should consult the Taylor Hobson Service Department for advice. Due to the complexity of the instrument and the need to disassemble parts of the instrument before moving, it is advised that no attempt is to be made to move the instrument without consulting Taylor Hobson.

WARNING:

THIS INSTRUMENT IS HEAVY AND UNSTABLE WHEN CARRIED. THEREFORE, IF IT IS REQUIRED TO MOVE LOCATION, IT IS NECESSARY TO PROVIDE A FORK LIFT OR OVERHEAD LIFTING GEAR WITH A SAFE WORKING LOAD OF 500kg (1000lb). THIS EQUIPMENT SHOULD ONLY BE OPERATED BY SUITABLY QUALIFIED PERSONNEL AND THE OPERATORS MUST ADHERE TO THE LOCAL IN FORCE REGULATIONS REGARDING LIFTING AND HANDLING OF HEAVY ITEMS.

Installation and Configuration

Transit items

Caution:

To prevent any damage to the instrument during movement, the instrument MUST be disassembled and the worktable clamped using the special transit bracket. Failure to follow these procedures during transit could result in serious damage. Before attempting to move a Talyrond 73 consult Taylor Hobson Service department.

Levelling the Instruments

Level the base unit by adjusting the four levelling feet, ensuring that the feet all remain in contact with the worktable or bench surface.

If high accuracy roundness measurements are to be made, then the instrument must be level. Such roundness measurements taken without proper levelling will contain an elliptical component. Use a spirit level on the homed C&L table surface and check that the instrument is level to within 0.1mm/m in both planes by careful fine adjustment of the four adjustable feet, levelling may need refining after being allowed to settle for 24 hours.

Connecting Up

Mains Supply / Voltage Selector. Connect a suitable plug to the mains lead, wired as follows:

- Brown to Live
- Blue to Neutral
- Yellow/Green to Earth

WARNING:

IT IS ESSENTIAL THAT THE ELECTRICAL SUPPLY TO THIS INSTRUMENT CONSISTS OF A THREE WIRE SYSTEM IN WHICH ONE WIRE IS THE EARTH (IT MUST NEVER BE CONNECTED TO A TWO WIRE SYSTEM WITH OR WITHOUT A SEPARATE EARTH). IT IS ALSO NECESSARY THAT THE ELECTRICAL SUPPLY TO THE INSTRUMENT IS CONNECTED VIA A SEPARATE MAINS ISOLATING SWITCH AND THAT PRIOR TO CONNECTION THIS SWITCH IS SET TO THE "OFF" POSITION.

Voltage Selector. Check that the voltage selector, on the back panel of the Rationalised Interface Unit (RIU) is set to the appropriate voltage.

Caution:

Before changing voltage, always ensure instrument is disconnected from the mains supply.

Connection of All Leads. There are a number of leads, which connect the instrument and the computer. These are shown in the following schematic views. When fully connected up, the system can be switched on.

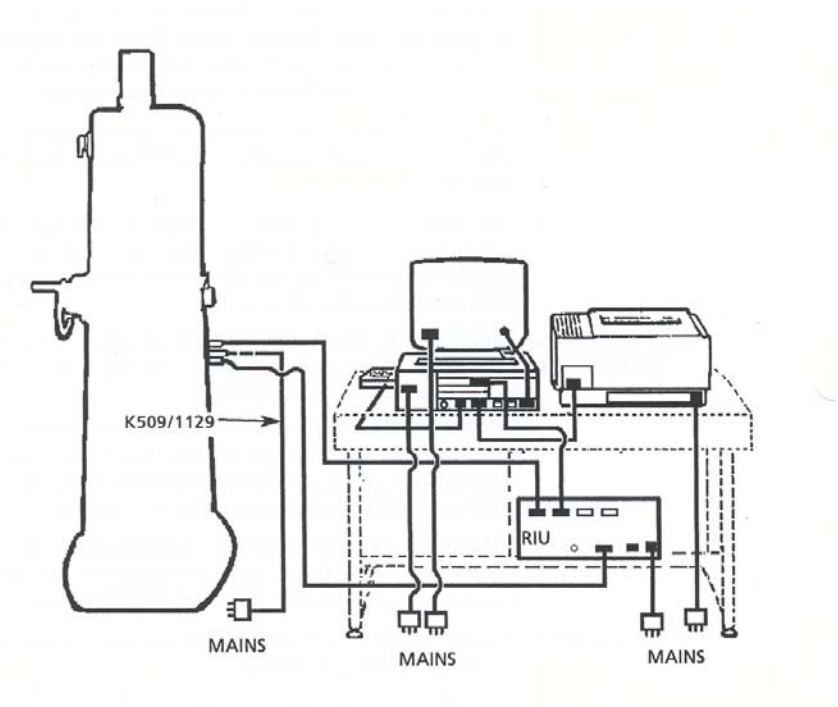
WARNING:

AFTER CONNECTING LEADS TO THE SYSTEM ALWAYS BE AWARE THAT THE INSTRUMENT COULD

MOVE UNEXPECTEDLY IF AN INCORRECT CONNECTION HAS BEEN MADE.

Caution:

Always remove the power from the system before disconnecting or reconnecting leads



Fuses . The two main fuses (6.3A, 250V fast acting, HBC, 5x20mm ceramic sand filled) are located above the mains lead as shown in the interconnection diagram. To access the fuses, remove the cover over the fuseholder and remove the mains lead. The fuseholder can now be removed by pressing the catch under the holder upwards and sliding the unit out.

Talyrond 4/450

Siting

For optimum performance, there should be no draughts, and a uniform temperature between floor and ceiling. The instrument should not be placed in direct sunlight. For best results the instrument should be operated in a room with stabilised temperature control that keeps the temperature/time gradient to less than $2^{o}C$/ hour.

WARNING:

THE TALYROND 4/450 EQUIPMENT WEIGHS APPROXIMATELY 6.5TONNES (14300lbs) AND APPLIES A FLOOR LOADING OF 1.5MN/m^2 (0.1TONF/in^2). THE FLOOR ON WHICH THE INSTRUMENT IS TO BE LOCATED MUST BE ABLE TO SUPPORT THE INSTRUMENT.

Installation and Configuration

Note:

Talyrond 4/450 Roundness instruments are initially installed by a representative of Taylor Hobson Limited. Subsequent moving and re-installation may be carried out but it is recommended that the user should consult the Taylor Hobson Service Department for advice.

Levelling the Instruments

Talyrond 4/450 (Standard levelling option). Level the base unit by adjusting the four levelling feet, ensuring that the feet all

remain in contact with the floor, see Fabreeka publications supplied with the levelling feet.

Talyrond 4/450 (Air levelling option). Level the base unit by adjusting the four air pressure levelling feet, ensuring that the feet all remain in contact with the floor, see manufacturer's publications supplied with the levelling feet.

Connecting Up

Mains Supply / Voltage Selector. Connect a suitable plug to the mains lead, wired as follows:

- Brown to Live
- Blue to Neutral
- Yellow/Green to Earth

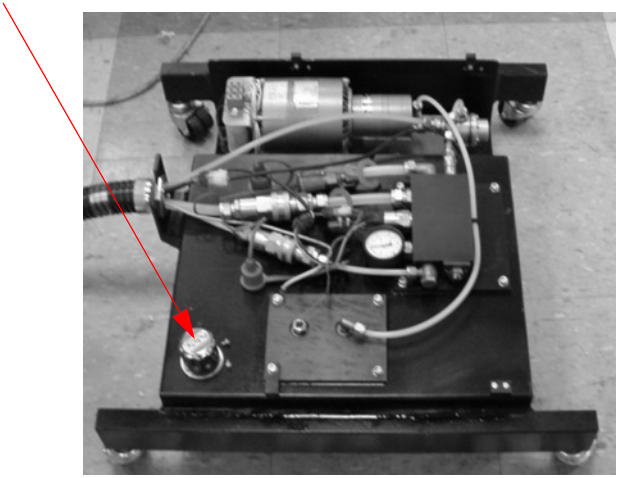
WARNING:

IT IS ESSENTIAL THAT THE ELECTRICAL SUPPLY TO THIS INSTRUMENT CONSISTS OF A THREE WIRE SYSTEM IN WHICH ONE WIRE IS THE EARTH (IT MUST NEVER BE CONNECTED TO A TWO WIRE SYSTEM WITH OR WITHOUT A SEPARATE EARTH). IT IS ALSO NECESSARY THAT THE ELECTRICAL SUPPLY TO THE INSTRUMENT IS CONNECTED VIA A SEPARATE MAINS ISOLATING SWITCH AND THAT PRIOR TO CONNECTION THIS SWITCH IS SET TO THE "OFF" POSITION.

Connection of (Air Levelling Option only). Used for the air levelling system. For the requirements for the air supply, consult the air levelling system manufacturer's publications supplied.

Connection of Oil Supply . The instrument requires 20 litres of Mobil Velocite No. 6, Taylor Hobson Part Number 8101/29123 to be inserted into the filler cap on the Auxiliary Pump Unit as shown in the following figure, always check the oil sighting window during filling to check the correct level:

Filler Cap



Connection of All Leads. There are a number of leads, which connect the instrument and the computer. These are shown in the following schematic views. When fully connected up, the system can be switched on.

WARNING:

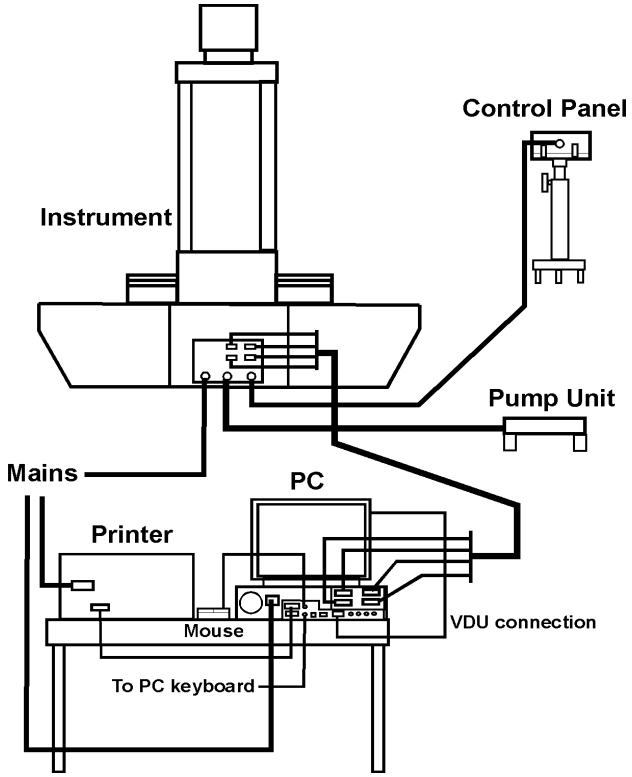
AFTER CONNECTING LEADS TO THE SYSTEM ALWAYS BE AWARE THAT THE INSTRUMENT COULD MOVE UNEXPECTEDLY IF AN INCORRECT CONNECTION HAS BEEN MADE.

Caution:

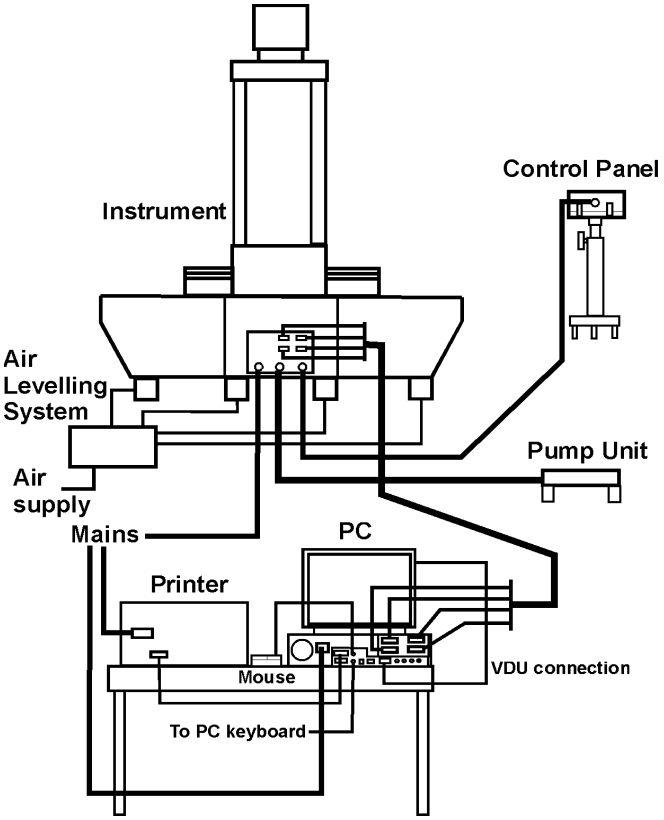
Always remove the power from the system before disconnecting or reconnecting leads

WARNING:

THE FUSES MUST ONLY BE REPLACED BY AUTHORISED AND COMPETENT PERSONNEL. THE MAINS LEAD MUST NOT BE RECONNECTED UNTIL THE FUSEHOLDER HAS BEEN REPLACED. ALWAYS REPLACE COVER AFTER CHANGING FUSES.



Talyrond 4/450 Standard interconnection



Talrond 4/450 Air Levelling System

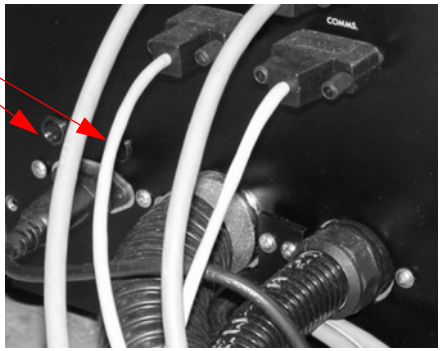
Fuses.

The main fuses are located as follows. Check that the fuses correspond to the values given:

PC. see PC manufacturer's publication

Printer. see Printer manufacturer's publication

Fuses



Talyrond 400/440

Siting (Talyrond 4/450 and 400/440)

For optimum performance, there should be no draughts, and a uniform temperature between floor and ceiling. The instrument should not be placed in direct sunlight. For best results the instrument should be operated in a room with stabilised temperature control that keeps the temperature/time gradient to less than 2^{o}C/hour.

WARNING (Talyrond 400/440):

THE TALYROND 400/440 EQUIPMENT WEIGHS APPROXIMATELY 3.5TONNES (7700lbs) AND APPLIES A FLOOR LOADING OF 0.5MN/m^2 (0.033TONF/in^2). THE FLOOR ON WHICH THE INSTRUMENT IS TO BE LOCATED MUST BE ABLE TO SUPPORT THE INSTRUMENT.

The instrument can be supported by four air levelling feet that must be positioned before the instrument is assembled.

Installation and Configuration

Note (400/440):

Talyrond 00/440 Roundness instruments are initially installed by a representative of Taylor Hobson Limited. Subsequent moving and re-installation may be carried out but it is recommended that the user should consult the Taylor Hobson Service Department for advice. Due to the size and complexity of the instrument it is advised that no attempt is to be made to move the instrument without consulting Taylor Hobson.

Levelling the Instruments

Talyrond 400/440 (Standard levelling option). Level the base unit by adjusting the four levelling feet, ensuring that the feet all remain in contact with the floor, see Fabreeka publications supplied with the levelling feet.

Talyrond 400/440 (Air levelling option). Level the base unit by adjusting the four air pressure levelling feet, ensuring that the feet all remain in contact with the floor, see manufacturer's publications supplied with the levelling feet.

Connecting Up

Mains Supply / Voltage Selector. Connect a suitable plug to the mains lead, wired as follows:

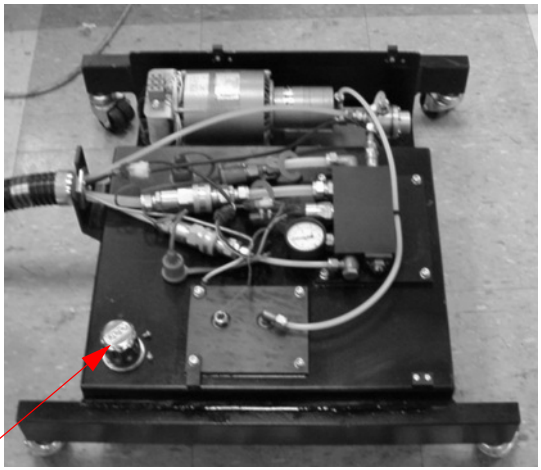
- Brown to Live
- Blue to Neutral
- Yellow/Green to Earth

WARNING:

IT IS ESSENTIAL THAT THE ELECTRICAL SUPPLY TO THIS INSTRUMENT CONSISTS OF A THREE WIRE SYSTEM IN WHICH ONE WIRE IS THE EARTH (IT MUST NEVER BE CONNECTED TO A TWO WIRE SYSTEM WITH OR WITHOUT A SEPARATE EARTH). IT IS ALSO NECESSARY THAT THE ELECTRICAL SUPPLY TO THE INSTRUMENT IS CONNECTED VIA A SEPARATE MAINS ISOLATING SWITCH AND THAT PRIOR TO CONNECTION THIS SWITCH IS SET TO THE "OFF" POSITION.

Air supply (Air Levelling Option only). Used for the air levelling system. For the requirements for the air supply, consult the air levelling system manufacturer's publications supplied.

Connection of Oil Supply. The instrument requires 20 litres of Mobil Velocite No. 6, Taylor Hobson Part Number 8101/29123 to be inserted into the filler cap on the Auxiliary Pump Unit as shown in the following figure, always check the oil sighting window during filling to check the correct level:



Filler Cap

Connection of All Leads. There are a number of leads, which connect the instrument and the computer. These are shown in the following schematic views. When fully connected up, the system can be switched on.

WARNING:

AFTER CONNECTING LEADS TO THE SYSTEM ALWAYS BE AWARE THAT THE INSTRUMENT COULD MOVE UNEXPECTEDLY IF AN INCORRECT CONNECTION HAS BEEN MADE.

Caution:

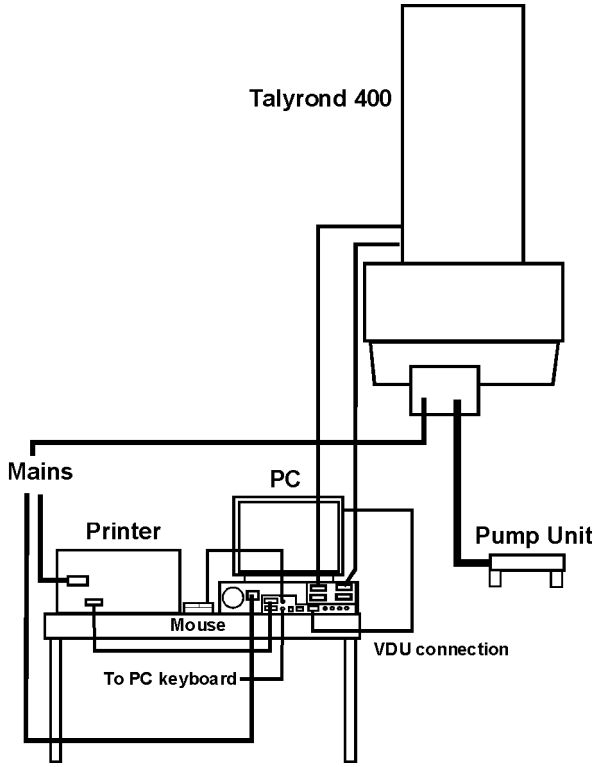
Always remove the power from the system before disconnecting or reconnecting leads

WARNING:

THE FUSES MUST ONLY BE REPLACED BY AUTHORISED AND COMPETENT PERSONNEL. THE MAINS LEAD MUST NOT BE RECONNECTED UNTIL THE FUSEHOLDER HAS BEEN REPLACED. ALWAYS REPLACE COVER AFTER CHANGING FUSES.

WARNING:

THE FUSES MUST ONLY BE REPLACED BY AUTHORISED AND COMPETENT PERSONNEL. THE MAINS LEAD MUST NOT BE RECONNECTED UNTIL THE FUSEHOLDER HAS BEEN REPLACED. ALWAYS REPLACE COVER AFTER CHANGING FUSES.



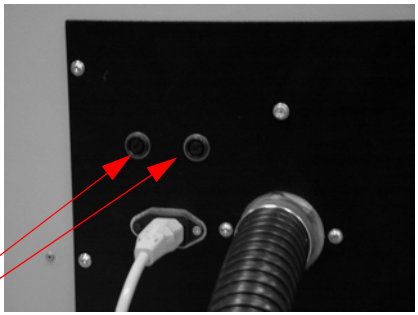
Fuses .

The main fuses are located as follows. Check that the fuses correspond to the values given:

PC. see PC manufacturer's publication

Printer. see Printer manufacturer's publication

Instrument. 2 x 5A fuse on instrument



Fuses

Other Hardware Installation

Computer and Accessories

For details of the power requirements for the computer and any accessories that do no derive their power from the system, refer to the manufacturers' documentation.

Interconnections

Connect the units as shown in the Interconnection diagrams on page 3.9 and 3.10. Ensure that a good earth is available for the instrument. This is essential for both safety and correct operation.

Fuses

The following fuses are used in the system.

PC. There is a fuse in the mains plug (UK only), see manufacturer's information.

VDU. There is a fuse in the mains plug (UK only), see manufacturer's information.

Printer. There is a fuse in the mains plug (UK only), see manufacturer's information.

Note: Initial installation is carried out by a service engineer, or a representative, of Taylor Hobson Limited.

WARNING: ALL CONNECTIONS AND DISCONNECTIONS MUST BE MADE WITH THE POWER SWITCHED OFF.

Switching On / Off

Once the instrument has been fully connected it may be switched on. Switch on the mains power and press the on/off switch on the computer. Once the computer has run its self-check routines, the software can be started using the on-screen Ultra icon.

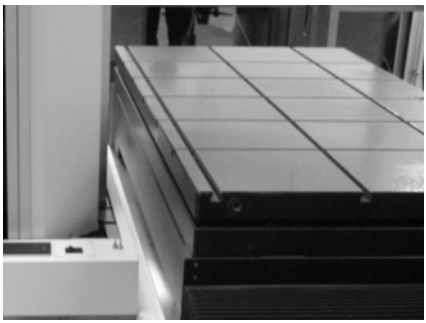
To switch off the system, switch off the computer, then switch off the mains power switches.

Talyrond 265/240/265XL. As in general procedure with the following addition, switch on the mains power and press the on/off switch on the RIU, then switch on the computer. To switch off the system, switch off the computer, then switch off the instrument at the RIU and main switches.

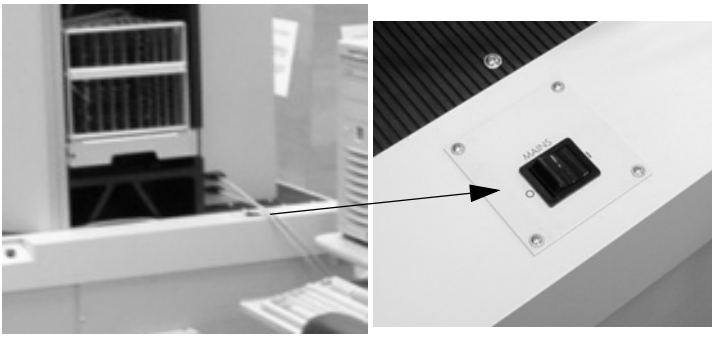
Talyrond 290/280/295/73. As in general procedure with the following addition, switch on the mains power and press the on/off switch on the RIM, then switch on the computer. To switch off

the system, switch off the computer, then switch off the instrument at the RIM and main switches.

Talyrond 4/450. Location of Mains switch on the instrument



Talyrond 400/440. Location of Mains switch on the instrument



Ultra Software Installation

The Talyrond "µltra" Software is installed by a service engineer, or a representative, of Taylor Hobson Limited. However, subsequent re-installation may be carried out by the user.

Note: Please pay particular attention to the terms and conditions of the Software Licence.

To re-install "μltra" Software

The installation of the software is a semi-automatic procedure, the operation being controlled by displayed commands to the operator from the computer.

The procedure for re-installing the software is detailed in the Release Notes supplied with the software.

The instrument is now ready to use. All further operating instructions are given in Chapter 6 or in the on-line help.

Chapter 4
Installation Instructions for the New Form Talysurf instruments

Introduction

New Form Talysurf instruments are initially installed by a representative of Taylor Hobson Limited. However, subsequent moving and re-installation may be carried out by the user. This must be done with care for the instrument and consideration for its applications and location. Sufficient information for this purpose is provided in this "Start-up" Guide and the "On-Line" Help of the Form Talysurf "µltra" Software.

Having completed the system installation, all details of the basic operation of the Form Talysurf "µltra" Software are obtained by reference to the software "On-Line" Help facility. In case of any queries or problems Taylor Hobson Limited can be contacted at the addresses shown at the back of this handbook.

Please retain this handbook for future reference.

Unpacking the Instrument

Initial installation is carried out by a service engineer, or a representative, of Taylor Hobson Limited. PLEASE DO NOT UNPACK YOUR INSTRUMENT, OR ASSOCIATED PRODUCTS, UNLESS WITH PRIOR AGREEMENT WITH A SERVICE ENGINEER OR REPRESENTATIVE OF TAYLOR HOBSON LIMITED.

Siting the instrument

The overall accuracy of measurement results will be influenced by environmental conditions, particularly; draughts, vibration and the rate at which the ambient temperature changes. The choice of location depends on the application requirement. However, to ensure that the optimum performance is achieved, wherever possible, the instrument hardware should be installed with consideration given to the surroundings in which it will operate.

The following items must be considered when siting the instrument;

Draughts

Draughts and airborne vibration should be avoided particularly when measuring in the skidless mode. Avoid placing the instrument in draughts or directly under air conditioning vents.

For particularly critical applications it is often beneficial to cover the instrument to minimise the effects of air movement and airborne vibration. A suitable cover is available from Taylor Hobson Limited.

Temperature Gradients

Avoid siting the instrument in areas that have a very rapid temperature gradient, as in the case of being near windows or skylights where sunlight may fall on the instrument.

Areas that experience temperature gradients of over 2°C/hour are not ideal for the measurement of precise form. For the measurement of surface texture parameters a higher value can be tolerated (in the order of 5°C/hour).

Vibration

Vibration is particularly detrimental for the measurement of surface texture. All New Form Talysurf instruments are supplied with appropriate frame and anti-vibration mounts. Additional pneumatic mounts (112/3116-01) are available from Taylor Hobson where best results are required.

Power Supply

It is important that a clean power supply should be provided to the instrument. If in doubt, many computer peripheral dealers can supply a suitable Uninterruptible Power Supply (U.P.S.). A complete U.P.S. system for the instrument can be obtained from Taylor Hobson Limited.

Hardware Installation

Table

Note: Initial installation is carried out by a service engineer, or a representative, of Taylor Hobson Limited.

With the instrument frame in the required position, use the adjustable feet to bring the frame level. A bubble level should be used to assist the operation and check the result.

The instrument weighs approximately 300Kg (660lbs). The FTS frame is capable of safely supporting this weight plus any other accessories.

Warning. The instrument weighs approximately 300Kg (660lbs) and should only be used with the specially designed frame supplied.

Base

Warning. The base is integral with the frame and together are very heavy, 165kg , exercise extreme caution when moving the base and frame assembly.

Column

Warning. The column is a very heavy item, 42kg. DO NOT attempt to lift the column by the leadscrew or the column carriage.

Warning: DO NOT leave a column standing in the vertical position if it has not been bolted into place.

Fit the two lifting handles, provided for lifting the colum. Ensure that the handles are screwed fully into the holes provided and locate the column on to the granite base. Remove the lifting handles and store in a safe place.

The user must decide whether to use manual or mechanical lifting, depending on the environment and the distance to be moved.

Traverse Unit

Warning. Before placing the traverse unit on the carriage adaptor plate, ensure that the adaptor plate is firmly secured to the column carriage.

Remove the transit hardware (painted red) and retain for future use.

To install the traverse unit on to a column, the carriage should be driven to about halfway up the column and the tilt adjustment (if applicable) set to bring the front plate approximately square. Engage the traverse unit on the location dowel. Fit 3 off fixing capscrews, but DO NOT tighten. Turn eccentric dowel to square the traverse unit to carriage back plate and tighten screws to a torque of 12Nm.

Environmental cover 112/3311-01

Warning. When moving this cover the lifting handles must be used. Fingers must at no time be between the frame and sliding doors as this can result in serious injury.

Positioning the PGI Gauge

The PGI Gauge can be mounted in one of three positions as shown in the following pictures. Fit the gauge to the instrument traverse unit.

Caution. Never attempt to change a Gauge with the power on.

Standard Position. Normal measurements.

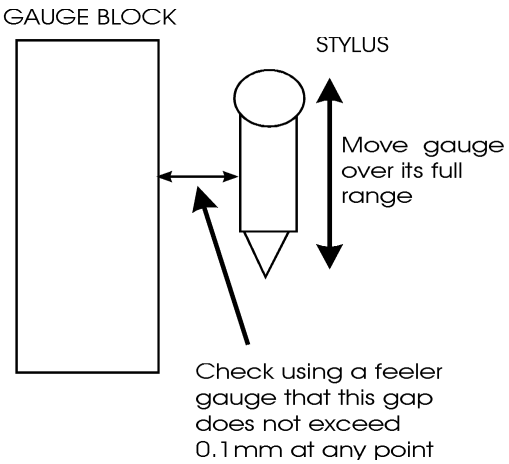
Extended position using mounting tube 112-3230. Enables measuremnts to be made where a longer reach is required. More prone to being affected by noise.

Low noise position. Offers the best mounting position for measurements where the effects of noise need to be minimised.

Fit the 120mm stylus arm (60mm arm may be used if this is the only stylus that the user will use).

Use a gauge block placed on the instrument base to check that the stylus motion is square to the instrument base.

Manually move the stylus through its full range and looking from above, check using a feeler gauge that the gap between the extremity of the stylus arm and the gauge block is not greater than 0.1mm at any point in the range.


GAUGE BLOCK
STYLUS
Move gauge over its full range
Check using a feeler gauge that this gap does not exceed 0.1mm at any point

Slacken carriage gauge tube clamp screws to adjust position of the gauge to achieve setting. Tighten upon completion.

Computer and Accessories

For details of the power requirements for the computer and any accessories that do not derive their power from the system, refer to the manufacturers' documentation.

Interconnections

Connect the units as shown in the Interconnection diagrams on page 3.9 and 3.10. Ensure that a good earth is available for the instrument. **This is essential for both safety and correct operation.**

Fuses

The following fuses are used in the system.

Electronics control module. Two T5.0 Amp fuses located above the mains inlet on the rear of the enclosure. There is also a fuse in the mains plug (UK only).

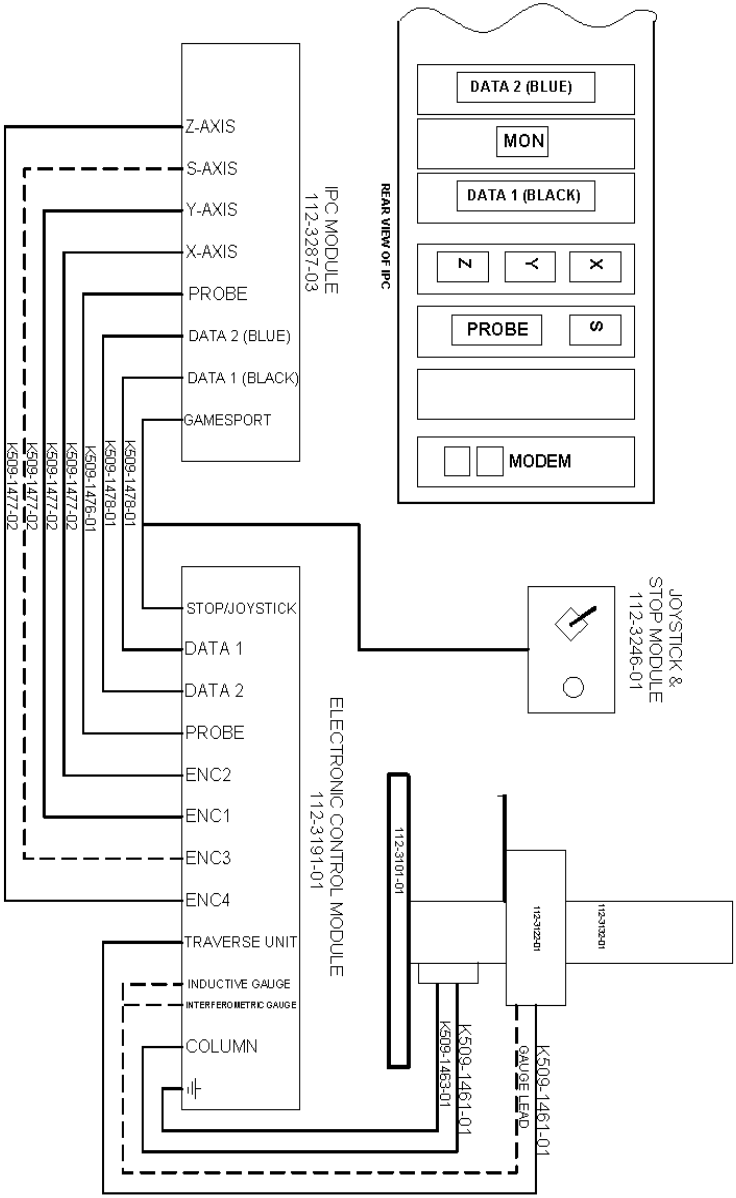
IPC. There is a fuse in the mains plug (UK only), see manufacturer’s information.

VDU. There is a fuse in the mains plug (UK only), see manufacturer’s information.

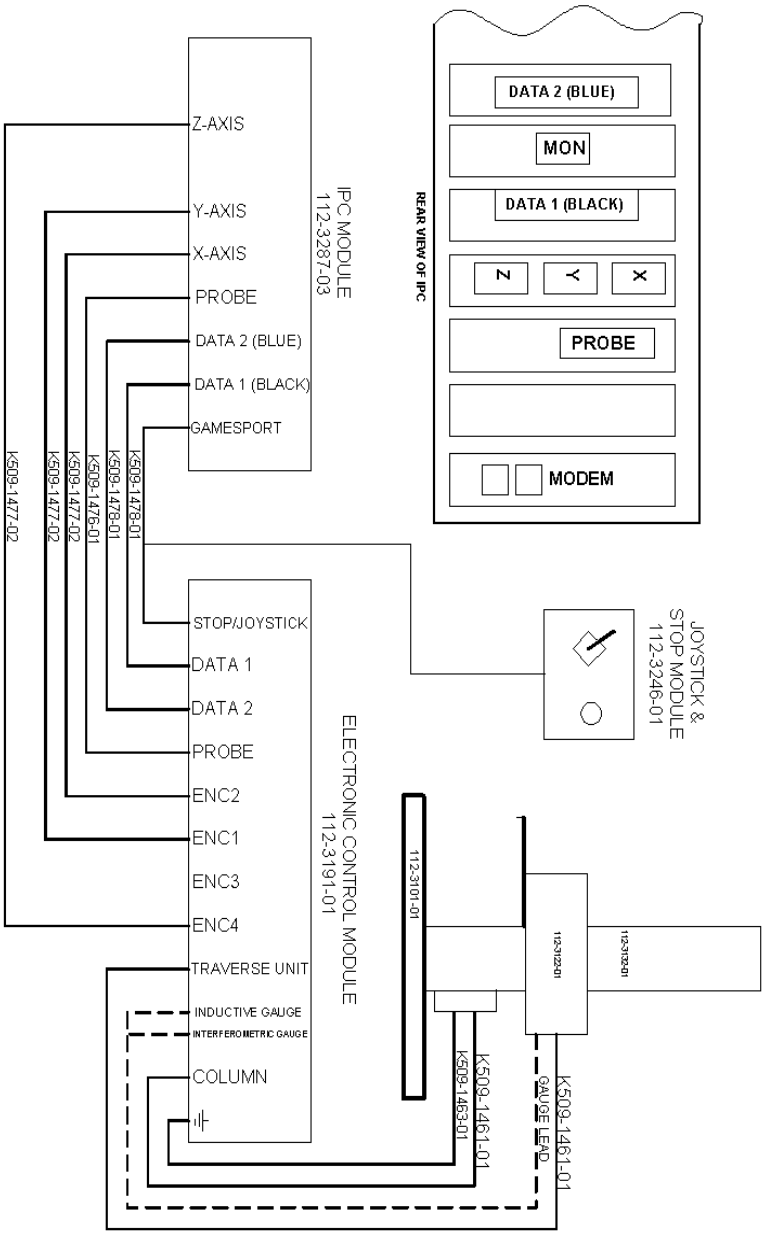
Printer. There is a fuse in the mains plug (UK only), see manufacturer’s information.

WARNING: All connections and disconnections must be made with the power switch OFF and the power disconnected.

Interconnection of system (tilt option)



Interconnection of system (non-tilt option)



Ultra Software Installation

Form Talysurf "μltra" Software and the Instrument Controller Software are installed by a service engineer, or a representative, of Taylor Hobson Limited. However, subsequent re-installation of Ultra may be carried out by the user.

Note: Please pay particular attention to the terms and conditions of the Software Licence.

Note: If the Instrument Controller Software requires reinstallation it is RECOMMENDED that a Taylor Hobson service engineer is contacted, otherwise the configuration may fail.

To re-install Form Talysurf "μltra" Software

The installation of the software is a semi-automatic procedure, the operation being controlled by displayed commands to the operator from the computer.

The procedure for re-installing the software is detailed in the Release Notes supplied with the software.

The instrument is now ready to use. All further operating instructions are given in the on-line help.

Chapter 5
Installation Instructions for the Form Talysurf Intra (PC Option)

Introduction

This section covers the following options:

- **Intra with Ultra and PC, M112/3344-XX**

– The Intra traverse unit can be connected direct to a PC via an RS232 lead , no SDLC required.

- **Intra ball unit with Ultra and PC, M112/3347-XX**

– Ultra provides support for the Taylor Hobson precision ball unit, this simple device provides circumferential surface finish measurement for ball and roller bearings.

- **Intra with Ultra, PCM or PC, M112/3345-XX**

– The Intra traverse unit can be driven either by Ultra windows software loaded onto a PC or the standard PCM Intra software.

- **Intra with Ultra, no PC, M112/3346-XX**

– It is possible to purchase the Intra traverse unit and Ultra software without the PC. The set up of this system is different to the other systems in many respects and these differences are highlighted in the text.

Please retain this handbook for future reference.

Setting up the instrument

Unpacking the Instrument (M112/3344-XX, M112/3345-XX and M112/3047-XX only)

Initial installation is carried out by a service engineer, or a representative, of Taylor Hobson Limited. PLEASE DO NOT UNPACK YOUR INSTRUMENT, OR ASSOCIATED PRODUCTS, UNLESS WITH PRIOR AGREEMENT WITH A SERVICE ENGINEER OR REPRESENTATIVE OF TAYLOR HOBSON LIMITED.

Unpacking the Instrument (M112/3346-XX only)

This instrument is not installed by Taylor Hobson. Unpack the instrument carefully and check that it contains the following parts:

112/2936-03 - Intra traverse Unit
112/2009 - Standard Diamond Stylus
112/2039 - Guard Nosepiece
112/2062 - Calibration ball
112/2564 - Inductive pick up
K509/1392 - RS232 lead
600-14 - Exploring Surface texture
112/3180-01 - Ultra software pack
K510/3014-01 - Ultra software

It is the responsibility of the customer to provide a pc for this option. The following pcs are the only ones recommended for use with this option.

Note: Using a PC other than those specified is done so at the customer's risk. Taylor Hobson assumes no responsibility for the operation of the system if a different pc to that specified is used.

PC option 1.

Dell GX260 Consisting of:

Pentium 4 1.8GHz
256 MB DDR266 Memory
20GB Hard Drive
LAN on board
17'' Monitor
CD ROM Drive

PC option 2

NEC Powermate ML4 Consisting of:

Pentium 4 1.6GHz
256 MB DDR266 Memory
20GB Hard Drive
LAN on board
17'' Monitor
CD ROM Drive

Siting the instrument

The overall accuracy of measurement results will be influenced by environmental conditions, particularly; draughts, vibration and the rate at which the ambient temperature changes. The choice of location depends on the application requirement. However, to ensure that the optimum performance is achieved, wherever possible, the instrument hardware should be installed with consideration given to the surroundings in which it will operate.

The following items must be considered when siting the instrument:

Draughts

Draughts and airborne vibration should be avoided particularly when measuring in the skidless mode. Avoid placing the instrument in draughts or directly under air conditioning vents.

For particularly critical applications it is often beneficial to cover the instrument to minimise the effects of air movement and airborne vibration.

Temperature Gradients

Avoid siting the instrument in areas that have a very rapid temperature gradient, as in the case of being near windows or skylights where sunlight may fall on the instrument.

Areas that experience temperature gradients of over 2°C/hour are not ideal for the measurement of precise form. For the measurement of surface texture parameters, a higher value can be tolerated (in the order of 5°C/hour).

Vibration

Vibration is particularly detrimental for the measurement of surface texture. It is essential that a good solid table, with anti-vibration mountings, is provided for applications in potentially "noisy" environments.

Power Supply-Mains Operation

It is important that a clean power supply should be provided to the instrument. If in doubt, many computer peripheral dealers can supply a suitable Un-interruptible Power Supply (U.P.S.). A complete U.P.S. system for the instrument can be obtained from Taylor Hobson Limited.

Hardware Installation

Table

A strong stable mounting, such as an instrument desk, is required to support the instrument (particularly when a column and stand is included). With the instrument desk in the required position, use the adjustable feet on the table to bring the table level. A bubble level should be used to assist the operation and check the result.

Warning. The base and column, together, weigh a maximum of 136 Kg (299 lbs). If the column and base are being used, the table must be capable of safely supporting this weight plus any other accessories.

Granite Base 112/3046

Warning. As the base weighs 100 Kg (220 lbs), exercise extreme caution when moving the base.

Note (not M112/3046-01): Initial installation is carried out by a service engineer, or a representative, of Taylor Hobson Limited.

Fit the four screw-in carrying handles, ensuring that they are screwed fully into the holes in the ends of the base (two handles at each end). Lift into position on the table. It is advisable to remove the handles after the base has been positioned.

The user must decide whether to use manual or mechanical lifting, depending on the environment and the distance to be moved.

Free Standing Base 112/3066

Installation information as for Granite Base except that the free standing base weighs 50kg (110lbs).

Column

Note (not M112/3046-01): Initial installation and setting of the column to the base (112-3046 only) is carried out by a service engineer, or a representative, of Taylor Hobson Limited.

The column is delivered laying horizontally. It should be lifted in this position.

Warning. The column weight is 36kg (79lb). DO NOT attempt to lift the column by the leadscrew or the handwheel.

Once one end of the column is positioned on the base, then the column can be raised from the horizontal to the vertical. It MUST

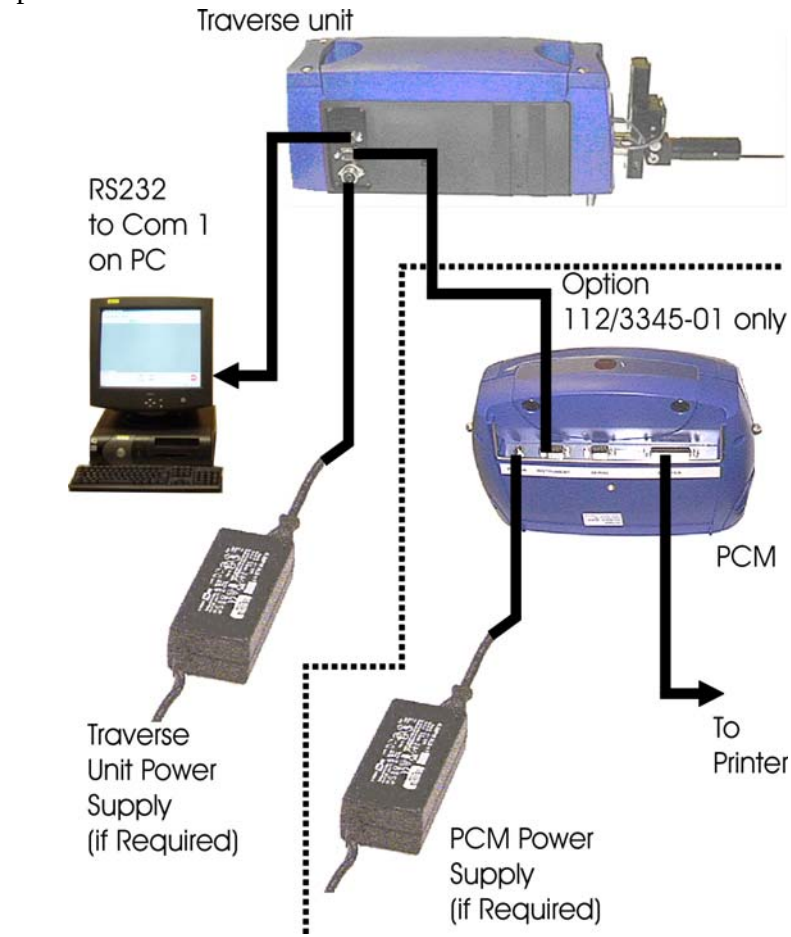
immediately be moved across the base until the column slots align with the base holes. Bolt the column into place.

Warning: DO NOT leave a column standing in the vertical position if it has not been bolted into place.

The user must decide whether to use manual or mechanical lifting, depending on the environment and the distance to be moved.

Interconnections

Connect the units as shown in the following diagram. Ensure that a good earth is available for the instrument if the power supply(ies) are connected. This is essential for both safety and correct operation.



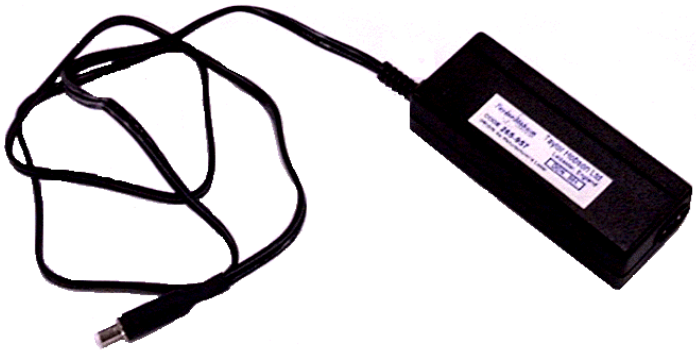
Note. Your Intra must be configured with only one connection for the PC/PCM and not two as shown. Either the PC or the

PCM can be plugged in depending on the configuration purchased.

Note: The traverse unit and the PCM (if fitted) can run on battery power, see page 5-8 of this section for detail.

Power Supplies (part number 265-957)

Low voltage power for the Traverse Unit and the Processor Control Module is derived from separate Power Supply Units. The two power supply units are identical as shown.



The Power supply Unit accepts a mains power input of 100-240V a.c. 50-60Hz 0.6-0.3A, and provides low voltage d.c output of +12V d.c. 2.5A 30W continuous.

Batteries and Charger

Use only the batteries supplied by Taylor Hobson Limited, part number 249/36. Allocate a particular battery for use in the Proces-

sor Control Module and the other two for use in the Traverse Unit. Ensure that they then remain only in use with their allocated units.

Do not use a partially charged battery with a fully charged battery in the traverse unit.

Battery Condition on Delivery. The instrument is delivered with the batteries in a discharged state. Before use, the batteries must be fully charged. Batteries must only be charged in the Taylor Hobson charger, part number 265/943.

Storage. If the instrument is to be unused or stored for more than one week, the batteries must be removed.

Disposal. Batteries can present an environmental hazard. Therefore:

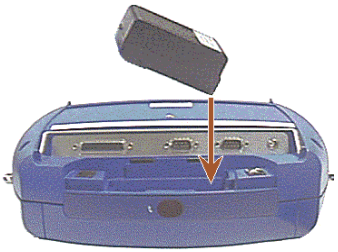
- Remove the batteries before disposing of a Traverse Unit or a Processor Control Module.
- The batteries can be returned to Taylor Hobson Limited for safe disposal.

Battery Short Circuit. Do not place a battery in a container that also has metal objects that may cause a short circuit. (e.g. do not carry a battery in a pocket that also contains coins or other metal objects). If the battery is short-circuited, an internal fuse will blow. This will render the battery useless.

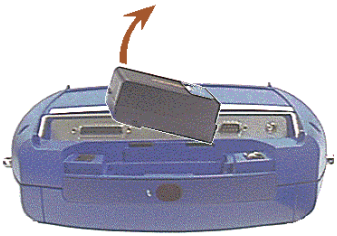
Note.If batteries are left in either unit when powered by the power supplies, it should be noted that there will still be a small current drawn from the batteries which will discharge the batteries over a period of time. If the either unit is to be powered by the power supply then the batteries should be removed.

Batteries in the PCM. To access the battery, ensure that the unit is switched off. Turn the two fasteners, to release the cover to the battery compartment and lift off the cover.

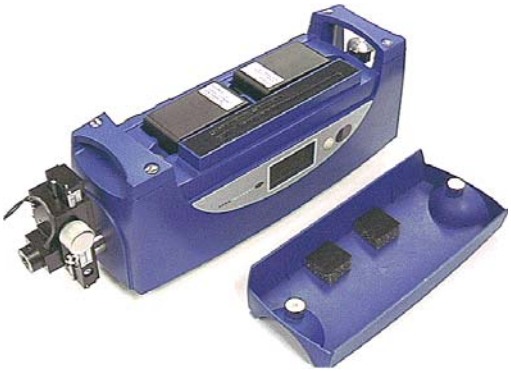
To fit the battery: Tilt the battery so that the end with the contacts is inserted first into the compartment in the PCM. Then push the battery into position until it is fully engaged.



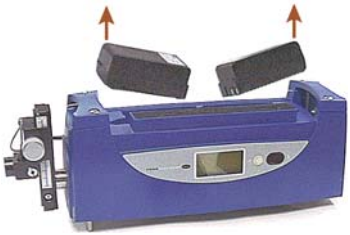
To remove the batteries: Pull on the end of the battery that is away from the contacts and lift the battery out of its compartment.



Batteries in the Traverse unit. To access the batteries, ensure that the unit is switched off and lift off the battery compartment cover.



To remove a battery: Pull on the end of the battery that is away from the contacts and lift the battery out of its compartment.



To fit the batteries: Place each battery into its compartment with the battery contacts to the centre of the Traverse Unit. The batteries are a tight fit in their compartments and to ease fitting, tilt each battery so that the end that is away from the contacts is

inserted into the compartment first. Then push into position, until fully engaged.

Charging Batteries

Before charging a battery it must be removed from the Traverse Unit or Processor Control Module and placed into the charger supplied.

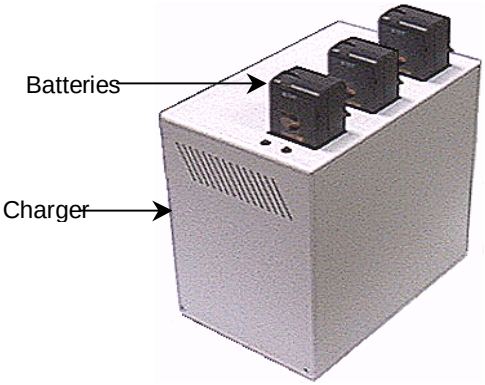
Recharging partially charged batteries. Unlike Nicad batteries, the batteries supplied with the instrument do not have a memory retention problem. Partially charged batteries may, therefore, be charged, as required. Do not attempt to discharge a battery by creating a short circuit (see WARNING below).

Warnings

Using unsuitable charging equipment may result in an explosion with associated injury and damage.

Use only the charger supplied, in accordance with the manufacturer's instructions. A full charge will require up to 2 hours.

Charger Operation



Charging Stages. The charging sequence consists of four stages. The soft start stage gradually increases current levels up to the fast charge rate during the first two minutes. The soft start stage is followed by the fast charge stage, which continues until termination. After termination, a two-hour topping charge is applied at a rate low enough to prevent cell heating but high enough to ensure a full charge. The topping charge is followed by a maintenance charge, which is intended to offset the natural self-discharge of the battery by keeping the cells primed at peak charge. The maintenance charge will continue as long as the battery is inserted in the bay.

The RED Charge Status indicator is activated continuously during soft start and fast charge. The GREEN Charge Status indicator is activated continuously during topping and maintenance charge.

Charge Termination Methods. The charger uses voltage slope, maximum temperature and charge timer methods to terminate fast charge. The maximum temperature and fast charge timer are used as a safety backup during the main charge cycle.

If the temperature of the battery exceeds the maximum limit during a charge cycle, the charger will shutdown and stop charging.

The YELLOW Battery Temperature indicator will latch on indicating a Hot Battery condition. The user must remove the battery and manually reset the charger via the recessed push-button switch situated at the back of the unit. The battery must be allowed to cool before it can be reinserted and charged again.

Note: Repeated over temperature shutdowns indicates a potential fault condition and the battery must be removed from service immediately and returned to the supplier with details of the problem.

The charger uses a timer to limit the fast charge duration to 144 minutes. For safety, the fast charge timer is always enabled and cannot be disabled.

Note: Powering-up, removing and re-inserting a battery, or manually resetting the charger using the push-button switch will reset the safety timer.

Battery Detection. Upon power-up, removal of a battery, or manual reset after an over temperature shutdown condition, the charger enters the battery polling detect mode. To indicate this mode, the YELLOW indicator will flash continuously. Once a battery is installed in a charger bay, the YELLOW indicator will stop flashing and the charger will enter the soft start stage.

Cold Battery Charging. The charger checks for a cold battery before initiating fast charge. If a cold battery is present before fast charge begins, the charger begins a two hour topping charge cycle. If the battery is still cold after the two hour topping charge is complete, the charger begins a maintenance charge. The maintenance charge will continue for as long as the battery remains cold. The charger checks the temperature every second to see if the battery has warmed up. If the battery warms up, the charger stops the topping or maintenance charge and begins the fast charge cycle.

The GREEN Charge Status indicator and the YELLOW Battery Temperature indicator will be active, indicating that a low current charge is being applied to the battery that is outside the specified temperature range for fast charging.

Safety Features. In the event of an accidental short circuit across the battery terminals inside the charger bay, the charger will automatically limit the internal current to 1.8A (normal fast charge current) to prevent damage to the electronics. The GREEN Charge Status indicator will flash and the YELLOW Battery Temperature indicator will turn on indicating the condition. The user must immediately turn off system power and remove the short circuit obstruction from the charger bay.

The input to each charger circuit is internally protected with a 3.15A fuse. A blown fuse indicates a fault condition and must not be replaced by the user.

Additionally, each battery pack includes a PTC fuse to protect against accidental short circuits across the battery pack terminals. The PTC should automatically reset itself when the short circuit condition is removed. If the pack does not recover from the short circuit condition, the battery must be removed from service immediately and returned to the supplier with details of the problem.

Please refer to the Operating and Safety Instructions for the Fast Charger System and Battery Packs supplied with the charger unit for additional safety information.

Assembling Gauge and Stylus

Before assembling the Gauge with the Adjustable Height Unit, read the description of how to fit the Gauge, given on page 5-20.

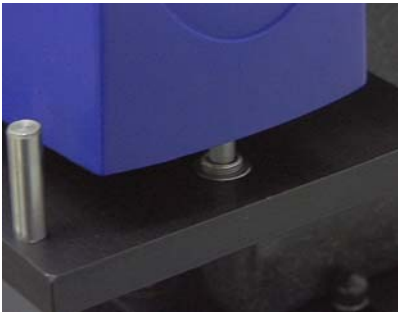
Before attempting to fit a Stylus into the Gauge, read the description given on page 5-19.

Mounting traverse unit onto column carriage

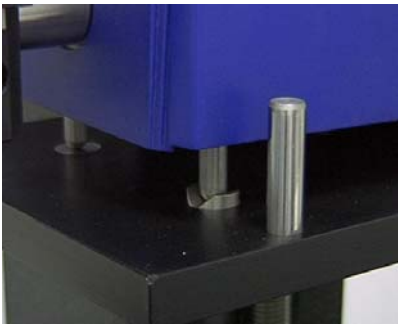
Warning. Before placing the traverse unit on the carriage adaptor plate, ensure that the adaptor plate is firmly secured to the column carriage.

The traverse unit is mounted onto the carriage as shown. The rear foot must be located in the rear cup mounting on the carriage and the front left foot (viewed from the rear of the traverse unit) located in the vee mounting. Levelling of the traverse unit is achieved by adjustment of the screwed cone mount in the adaptor plate, located under the rear TU foot.

Rear foot location



Front feet location

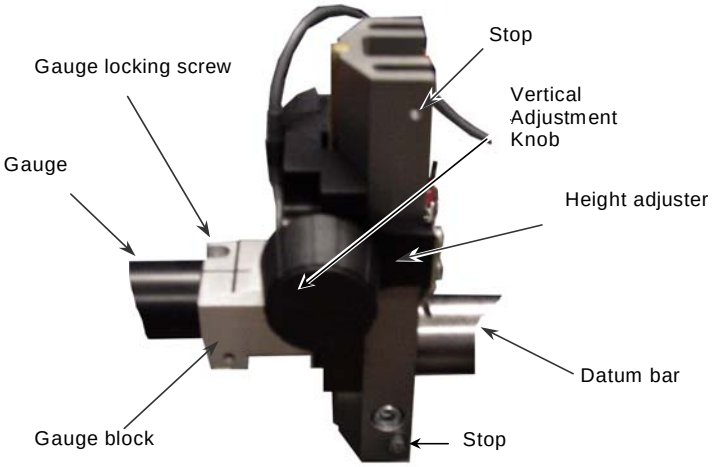


Interconnections when mounted onto column and base

The electrical connections to the traverse unit when mounted on the column are identical. Care must be taken when positioning the traverse unit on the column carriage that the cables to the traverse unit are not or are not likely to be stretched during operation.

The Adjustable height Unit

Mounted on the end of the Traverse Unit datum shaft is a Adjustable Height Unit.



The assembly, complete with gauge, can be raised and lowered by rotating the vertical adjustment knob on the side of the unit (clockwise to raise the pick-up, anti-clockwise to lower it). Stop screws at each end of the vertical traverse guide bar limit the travel of the height adjuster.

The range of vertical adjustment allows the stylus to be positioned between 70mm (nominal) above traverse unit base and 24mm (nominal) below traverse unit base.

Fitting the Gauge

The Gauge is mounted onto the Height Adjuster by carefully engaging the small diameter connector at the rear of the Gauge

into the socket on the front of the Gauge Block. The Gauge Block is screwed onto the Height Adjuster. The Gauge Block socket houses a number of pins. These must align with the holes in the end of the Gauge connector. When the Gauge is fully engaged with the Gauge Block, turn the Gauge Locking Screw, on the top of the Gauge Block and gently clamp the Gauge.

The adjustable height unit enables the gauge to be used in both its normal position and at right angles according to how the gauge block is oriented. page 5-20 shows the gauge block and the gauge in the normal position. By unscrewing the gauge block from the height adjuster it can then be screwed back onto the height adjuster oriented through 90^{o} to enable right angle use.

Important. When using the adjustable height unit in right angle mode, the pick-up must first be calibrated in the normal in-line condition then, without disturbing the stylus, the pick-up should be removed from the gauge block. The gauge block is then refitted as stated above and the pick up carefully reinserted into the gauge block.

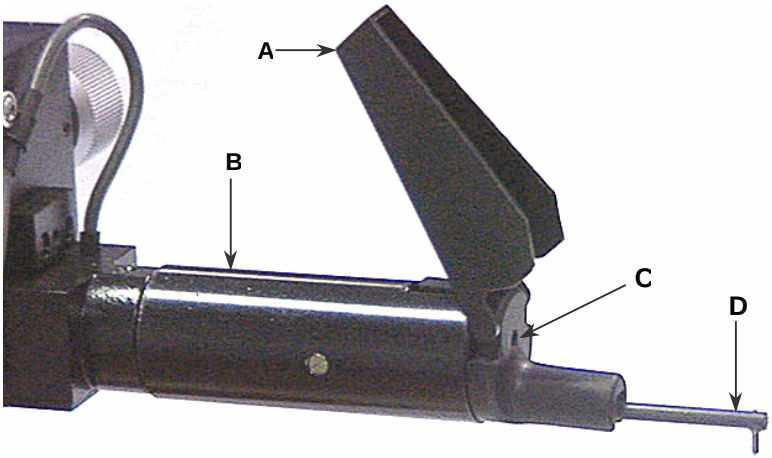
Note. When a right angle measurement is made, Right Angle Pick-up USED must be selected from the menu GAUGE SET UP options.

Important. It is not practical to use a right angle attachment, in conjunction with the accessory column and stand as the stylus will overhang the edge of the base. However, should this arrangement be required, a suitable column and stand can be supplied on application to Taylor Hobson or its local agents.

There will be degradation in performance when using the gauge in the right angle mode with all gauges and styli.

The Gauge

The Gauge comprises a variable inductance transducer with a linear measuring range of 1mm. The Gauge is plugged into the Adjustable Height Unit of the Traverse Unit and can be used either with or without a Guard Nosepiece. A number of interchangeable Stylus Arms can be used with this Gauge.



A Guard Nosepiece B Gauge Body
C Guard Nosepiece Clamp Screw D Stylus arm

When the cover of the Guard Nosepiece is closed over the stylus, the possibility of accidental damage to the stylus beam is minimized. The Guard Nosepiece can be used in conjunction with the Styli (112/2009, 112/2011, 112/2012 or 112/2013). Do not use when stylus 112/2010 is fitted.

The Stylus

The standard Stylus types available for use with the inductive Gauge are diamond tipped with an effective arm length of 60mm

and Sapphire ball tipped with an effective arm length of 120mm. The measurement range is dependent on the length of the Stylus Arm i.e. a 60mm arm gives a range of 1mm, a 120mm arm gives a range of 2mm.

The type of assessment required determines the Stylus to be used. Surface texture assessments are only valid when a Diamond Tipped Stylus is fitted. Form assessment is available with all styli, the vertical range required to trace the component profile will determine the length of Stylus Arm to be used.

To fit or change a Stylus, pull out the Stylus that is fitted and gently push in the one required.

The end of the arm is shaped to fit the socket in the Gauge cartridge and must be fitted with the flat uppermost, when the Gauge is set for measurement on a surface below it.

Caution. The pivot of the Gauge is a delicate mechanism. Therefore, care must be taken when changing the stylus, not to force the beam into its socket or to impart a sideways or twisting movement.

Note. The Stylus force is determined by balancing the arm with a small collar. When fitting or removing the Stylus, do not pull or push on this collar and disturb its position.

Y axis stage

The instructions for using the Y stage are given in leaflet K505/69.

Ball and Roller Unit

The instructions for using the Ball and Roller Unit are given in leaflet K505/60-01

Software Installation

Form Talysurf "μltra" Software is installed by a service engineer, or a representative, of Taylor Hobson Limited. However, subsequent re-installation may be carried out by the user.

Note: Please pay particular attention to the terms and conditions of the Software Licence.

To install or re-install Form Talysurf "μltra" Software

The installation of the software is a semi-automatic procedure, the operation being controlled by displayed commands to the operator from the computer.

The procedure for re-installing the software is detailed in the Release Notes supplied with the software.

Chapter 6
Operating Instructions common to both Surface and Roundness

Note.

In the following operating instructions, the details relate to surface software, for roundness software replace Form talysurf with Talyrond and Surface Finish with Roundness. Some dialogs may differ slightly in content but the procedure is identical.

Starting Ultra

- Startup from Windows "Start" menu. Click on Programs>Taylor Hobson >Ultra Version X.XX.
- A logon dialog is shown. Wait until the MetroServer application has been started and its icon appears in the system tray before logging on.

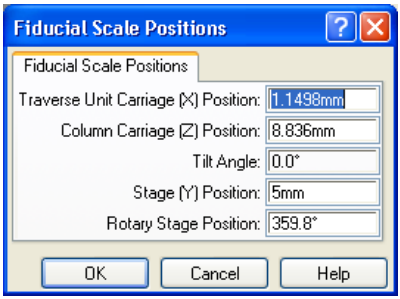
To check whether ready hover over the Metroserver icon in the system tray and wait until the tool tip reports ‘Ready’.

User configuration

The Administrator : Logs On

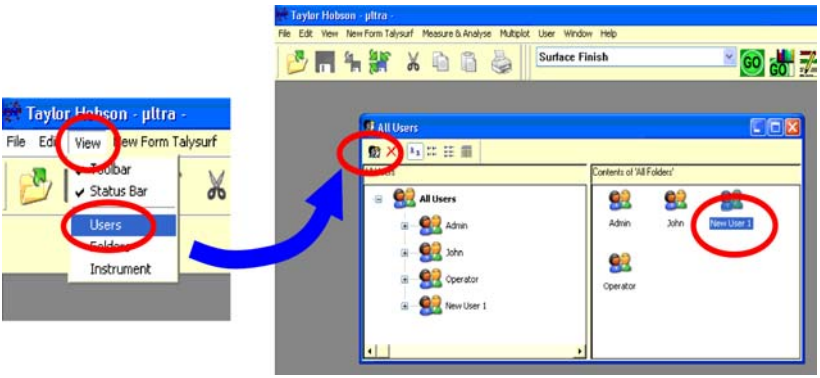
- Type ‘admin’ and then enter Password (if set) and click **Logon**

- Read off Axes Positions from Fiducial Scales, Type in the Values in the dialogue and click OK



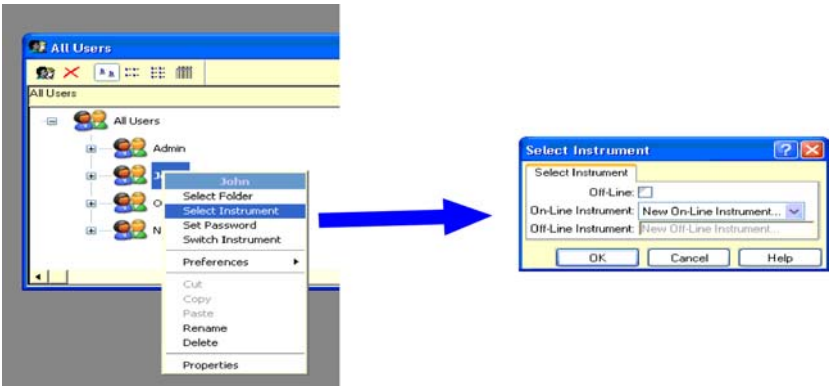
The Administrator : Creates Users

- Select View>Users>New User and Enter Name

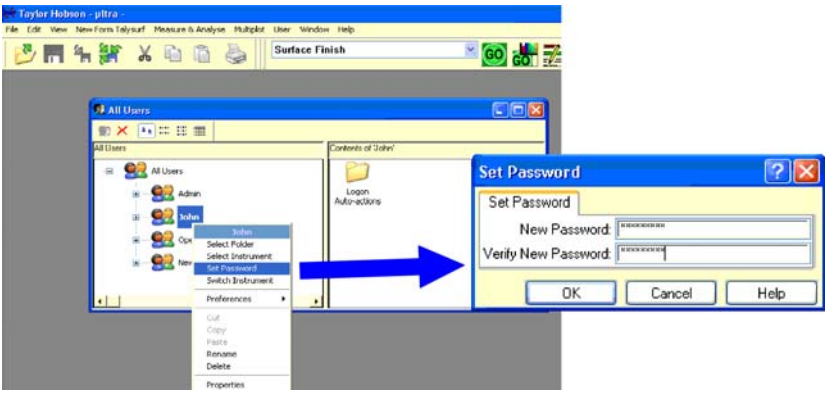


Each User : Selects Instrument & Password

- Right Mouse Click on the User and click Select Instrument>OK and Complete Dialogue by entering new instrument name and selecting instrument type.



- Right Mouse Click User and click Set Password



- Enter New Password, Verify It and click OK

Note: Passwords are Case Sensitive!

The Administrator : Logs Off:

- Select File>Log off

A User Logs On :

- Type user name and then click **Logon**

The User : Sets Up Workspace

- Select Form Talysurf>Measurement Toolbar and drag and drop Measurement toolbar to required position.
- Select Form Talysurf>Instrument Toolbar, see page 5-14.
- Select Form Talysurf>Units Toolbar and drag and drop Units toolbar to required position. Select desired units.

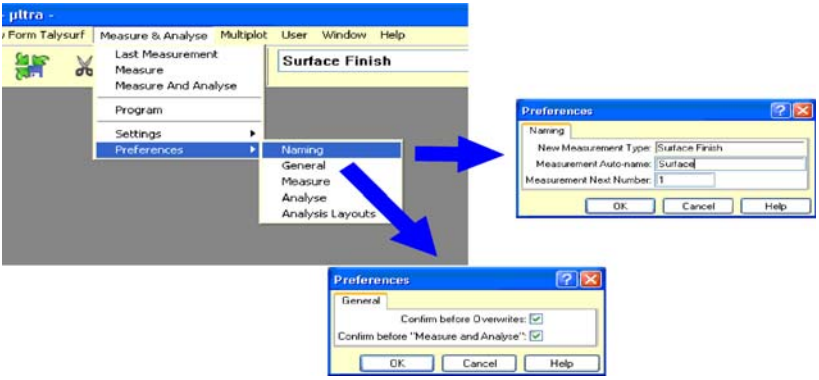
If required a software 'joystick' control can be selected. This has two forms, firstly a floating dialog and secondly a docking toolbar. To enable either of these, click on **Form Talysurf>Control** and then select the required option.

The User : Creates Folders For Work

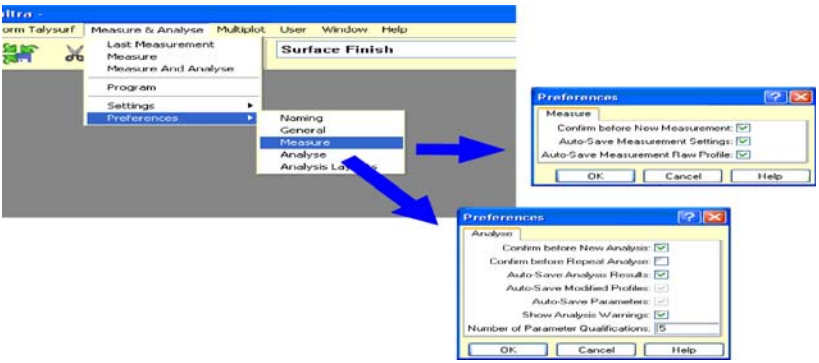
- Select View>Folders.
- A folder with the same name as the User name will be shown. Click New Folder
- Type required Name and click Enter

The User: Sets Preferences

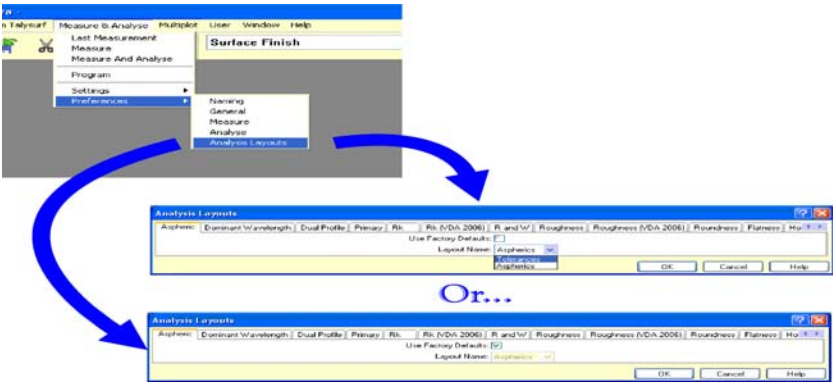
- Select Measure & Analyse>Preferences>Naming OR General and complete dialogs.



- Select Measure & Analyse>Preferences>Measure OR Analyse and complete dialogs.

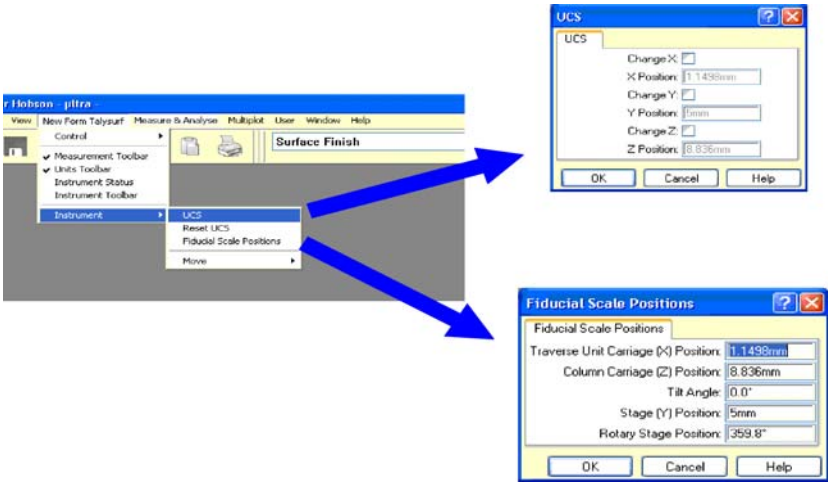


- Select Measure & Analyse>Preferences>Analyse Layouts and complete dialogs.



Calibrating the Axes

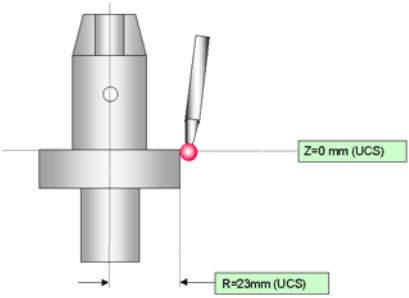
- Select Form Talysurf>Instrument and select appropriate option.



1. **Fiducial Scale Positions (default).** Enter Traverse Unit, Column & Y Stage Positions (Arm and Column on Roundness instruments) and click OK. The axes on the Instrument Tool-

bar now show the New Fiducial Scale position values.
Note: The Fiducial scales on the TR290/295 Roundness Instruments are set up to the instrument at start up and cannot be changed.

2. **User Coordinate System (UCS) (option)**. Check box & enter UCS (X, Y &/or Z) Positions and click OK. The axes on the Instrument Toolbar now show the new UCS values.
Note: On Roundness position stylus at reference point and enter values into dialog.



Reset UCS. This will return the system to the Fiducial Scales, all UCS values are reset. The axes on the Instrument Toolbar now show the current Fiducial Scale position values.

Basic Database management

Database back-up

- Click on **User>Backup**.
- Browse to the Backup Location.
- Select Backup Option and click OK

Options are:

Backup Now. Will immediately copy complete database to the backup location when OK is selected.

Incremental Backup Enabled. Will immediately copy only data that has been added since the previous backup to the backup location when OK is selected.

Daily Backup Enabled. Will copy complete database to the backup location at the time selected.

Note; Setting Daily Back-up to occur when the instrument is in normal use will cause the software to run very slowly. Always set the back-up time to a time when the instrument is normally not in use.

IMPORTANT: Always Set Backup Location to a folder other than that containing the Ultra Software.

Database Archive

- Click on View>Folders.
- Right Mouse Click on required folder.
- Click on Export>Archive.
- Browse to the archive location
- Select Archive Options and click OK

Options are:

Archive. Is used to save individual files, the contents of a folder, or files that fall between two dates and times within a folder.

Archive All Items. Option will archive all data in the selected folder.

Delete After Archiving. Option automatically deletes the selected files from the database once the archive operation is complete

Restore from Archive

- Click on View>Folders.
- Highlight Destination Folder.
- Click on Import.
- Select File Type (*.SAR) & File Name and click Open restored Archive

The restored archive files are placed in a folder (created by the system) under the currently selected folder named ‘restored archive #’ (where # is a number which increments at each restore). This prevents files or folders of the same name being overwritten.

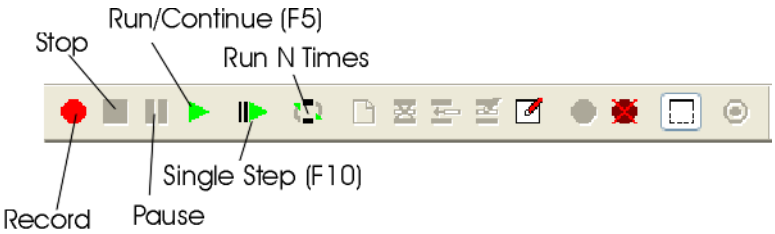
Basic Programming

The Program dialog can be selected in one of three ways:

- Selecting the program button on the measurement toolbar.
- Selecting View>Folders and on the Folder dialog toolbar selecting New Program
- Selecting Measure & Analyse>Program.

In each case the Program dialog is displayed.

Recording the program



On the Program dialog toolbar select the Record button to put the program into the learn mode.

Any instrument control, measurement or analysis steps that are carried out will be recorded in the program, in the sequence that they are carried out in.

As each step is carried out, it is recorded and shown in the program dialog. User messages and pause statements cannot be inserted during the learning sequence. They can be inserted in Edit mode.

When all the required operations have been performed, select the Stop button on the Program dialog toolbar to end the learning sequence.

To save the program either right mouse click on the dialog, which will display a menu prompting you to Save or Save As or close the dialog. When closing the dialog a Confirm dialog is displayed, make the appropriate response.

How Do I Run and View a Program?

Running a program is carried out in one of three ways, controlled from the buttons on the toolbar of the Program dialog.

The buttons used are:

Run/Continue [F5]. Selecting this button will execute the program once only. If the program is paused selecting it again will continue the program.

Single Step [F10]. Select this button and there will be a pause before running the first step. Reselect the button to execute the current step and advance the program to the following step. Repeat for further steps.

Run N Times. Selecting this button will display the Run N Times dialog, enter the number of times that you wish to run the Program.

Stop button. To stop a program during execution, select the Stop button from the Program dialog toolbar.

Pause button. To pause the Program during execution, select the pause button on the Program dialog toolbar.

To continue reselect the Pause button. During execution, the current program step is highlighted to enable the user to follow the program's progress. If a breakpoint has been set on a step within a program then the execution of the program will pause when this step is reached. To continue a program, reselect the pause button.

Viewing A Program

To view a Program, from the **View>Folders**. In the right hand pane double click on the Program you wish to view. This will then display the Program dialog.

Chapter 7
Roundness Operating Instructions

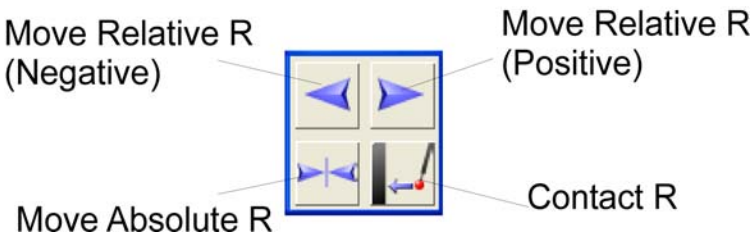
Introduction

The Operating Instructions are organised into a number of sub-sections to enable you to find the information required quite quickly.

The sub-sections of this chapter describe the major software controls and the main 'How Do I' operations to enable you to set up the instrument, make a simple measurement and then do more advanced operations with the instrument.

Major Controls

Radial Arm (R) Device Control



Selected by:

- Clicking on **Talyrond>Control>Radial Arm (R)**.

NB The option will be 'ticked' if the dialog is already open.

Or

- Clicking on **Talyrond>Instrument Status** and double clicking on the Arm icon.

Or

- Right mouse clicking on the Radial Arm icon on the Instrument Status dialog or the Instrument Toolbar and selecting Control.

Or

- Right mouse clicking on the Radial Arm icon on the Instrument Status dialog or the Instrument Toolbar.

The buttons on this dialog are:

Move Relative R (Negative). Selecting this button displays the Move Relative R (Negative) dialog, which controls the amount of movement of the Arm in the Extend direction. The default is 0mm, therefore to move the arm, an appropriate figure must be entered in this dialog. The Accuracy of the position can also be selected by selecting either Accurate or Fast. Once a value is entered and OK is selected the Arm will move by the specified amount relative to its last position. The accuracy will depend on the type of instrument in use.

Move Relative R (Positive). Selecting this button displays the Move Relative R (Positive) dialog, which controls the amount of movement of the Arm in the Retract direction. The default is 0mm, therefore to move the arm, an appropriate figure must be entered in this dialog. The Accuracy of the position can also be selected by selecting either Accurate or Fast. Once a value is entered and OK is selected the Arm will move by the specified amount relative to its last position. The accuracy will depend on the type of instrument in use.

Move Absolute R. Selecting this button displays the Move Absolute R dialog, which is used to control the absolute movement of the Arm. The default of the Arm (R) Position field is the current position of the Arm, therefore to move the Arm to another position an appropriate figure must be entered in this field. The Accuracy of the position can also be selected by selecting either

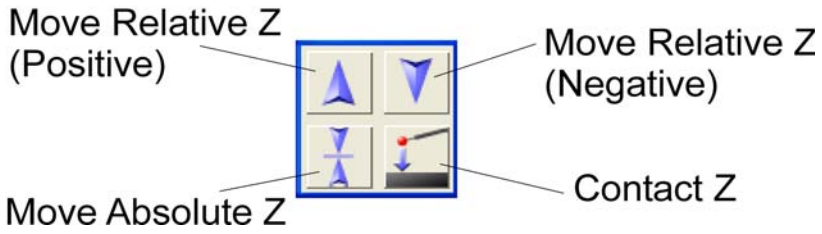
Accurate or Fast. Once a value entered and OK is selected the Arm will move by the specified amount relative to its last position. The accuracy will depend on the type of instrument in use.

Contact R. Selecting this button will move the axis in the currn-tly specified contact direction until the gauge is within the centre of its range.

Note. When the instrument in use has a manual arm selecting this button displays the Contact dialog. The Contact dialog will ask the user to move into contact and then enter the figure from the arm. On the Instrument Status dialog the figure under the Arm icon will update.

To stop a movement before it is completed, press the Stop (red) button on the instrument control panel.

Column (Z) Device Control



Selected by;

- Clicking on **Talyrond>Control >Column (Z**).
- ***NB The option will be 'ticked' if the dialog is already open.***

Or

- Clicking on **Talyrond> Instrument Status**, double clicking on the Column icon.

Or

- Right mouse clicking on the Column icon on the Instrument Status dialog or the Instrument Toolbar and selecting Control.

Or

- Right mouse clicking on the Column icon on the Instrument Status dialog or the Instrument Toolbar.

The buttons on this dialog are:

Move Relative Z (Negative). Selecting this button displays the Move Relative Z (Negative) dialog, which controls the amount of movement of the Column Carriage in a downwards direction. The default is 0mm, therefore to move the Carriage an appropriate figure must be entered in this field. The Accuracy of the position can also be selected by selecting either Accurate or Fast. Once entered and OK is selected the Arm will move by the specified amount relative to its last position. The accuracy will depend on the type of instrument in use.

Move Relative Z (Positive). Selecting this button displays the Move Relative Z (Positive) dialog, which control the amount of movement of the Column Carriage in an upwards direction. The default is 0mm, therefore to move the Carriage an appropriate figure must be entered in this field. The Accuracy of the position can also be selected by selecting either Accurate or Fast. Once entered and OK is selected the Arm will move by the specified amount relative to its last position. The accuracy will depend on the type of instrument in use.

Move Absolute Z. Selecting this button displays the Move Absolute Z dialog, which is used to control the absolute movement of the Column Carriage. The default of the (Z) Position field is the current position of the carriage, therefore to move the Carriage to another position an appropriate figure must be entered in this field. The Accuracy of the position can also be selected by selecting either Accurate or Fast. Once entered and OK is selected the Arm

will move by the specified amount relative to its last position. The accuracy will depend on the type of instrument in use.

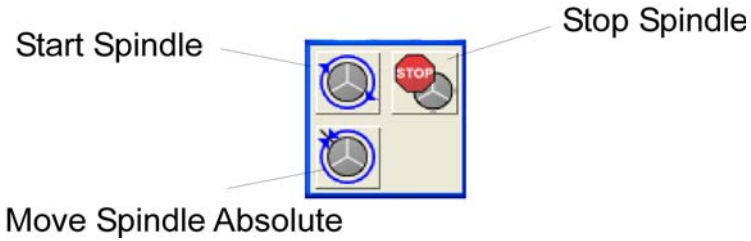
Contact Z . Selecting this button will move the axis in the currntly specified contact direction until the gauge is within the centre of its range.

Note. When the instrument in use has a manual column selecting this button displays the Contact dialog. The Contact dialog will ask the user to move into contact and then enter the figure from the column. On the Instrument Status dialog the figure under the Column icon will update.

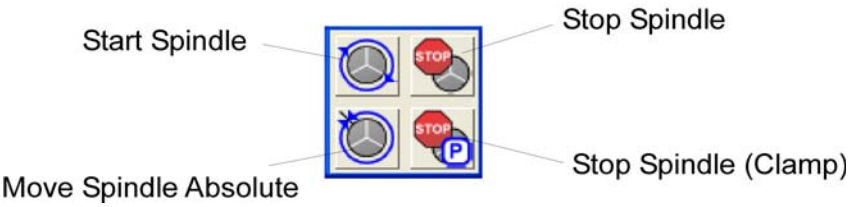
To stop a movement before it is completed, press the stop (red) button on the instrument control panel.

Spindle (C) Device Control

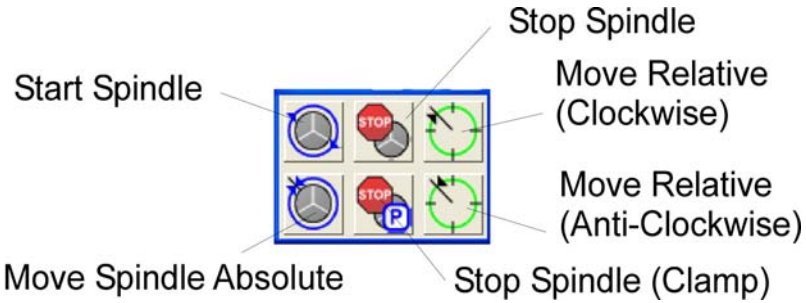
TR130/115/131.



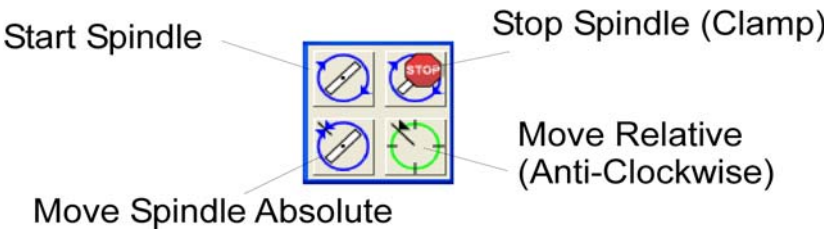
TR265/240/265XL.



TR290/280/295/400/440.



TR4/TR450.



Selected by:

- Clicking on **Talyrond>Control>Spindle (Theta)**.
- ***NB The option will be 'ticked' if the dialog is already open.***

Or

- Clicking on **Talyrond>Instrument Status**, double clicking on the Spindle icon.

Or

- Right mouse clicking on the Spindle icon in the Instrument Status dialog or Instrument Toolbar and selecting Control.

Or

- Double clicking on the Centring and Levelling icon in the Instrument Status dialog or Instrument Toolbar.

Note. The options available on this dialog will be limited in accordance with the instrument capabilities.

The buttons on this dialog are:

Start Spindle. Selecting this button displays the Start Spindle dialog, which controls the speed and direction of the spindle. Once selected and OK is selected the spindle will rotate continuously at the selected speed.

Move Spindle Absolute. Selecting this button displays the Move Spindle Absolute dialog. The default of the Spindle Position field is the current position of the spindle, therefore to move the spindle to another position an appropriate figure must be entered in this field. The Direction field controls the direction in which the spindle will move when OK is entered. Once entered and OK is selected the spindle will move in the given direction to the new position.

Stop Spindle. Selecting this button will stop the spindle although manual clockwise movement is possible once the spindle has stopped.

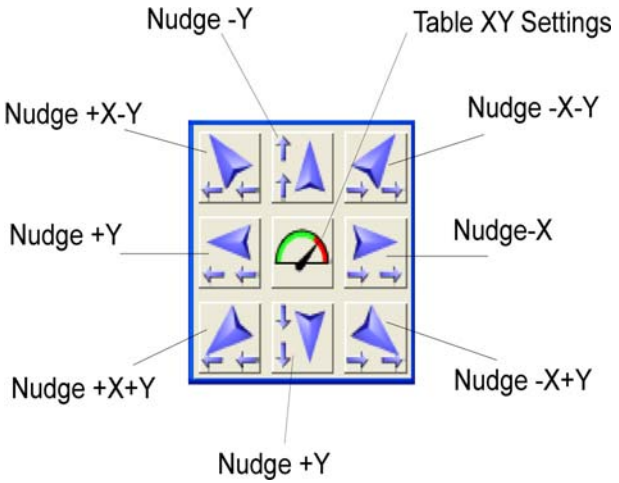
Stop Spindle (Clamp). Selecting this button will stop the spindle and apply an air-operated clamp.

Notes.
(1) The air-operated clamp is automatically applied when horizontal and vertical straightness measurements are being taken.

(2) If the Stop Spindle Clamp button has been selected to stop the spindle, in order to turn the table manually you must then select the Stop Spindle button.

Move Relative. Selecting this button displays the Move Relative dialog, which controls the amount of movement of the Spindle. The default is 0mm, therefore to move the Spindle an appropriate figure must be entered in this field. The Accuracy of the position can also be selected by selecting either Accurate or Fast. Once entered and OK is selected the spindle will move by the specified amount relative to its last position. The accuracy will depend on the type of instrument in use.

Table Centring (X-Y) Device Control



This control is available on instruments equipped with automatic centring and levelling tables. It provides the user with a means to manually move the centring (X-Y) axes.

Selected by;

- Clicking on **Talyrond>Control >Table**.
- ***NB The option will be 'ticked' if the dialog is already open***.

Or

- Clicking on **Talyrond>Instrument Status**, double clicking on the Centring and Levelling icon.

Or

- Right mouse clicking on the Centring and Levelling icon in the Instrument Status dialog or Instrument Toolbar and selecting Control.

Or

- Double clicking on the Centring and Levelling icon in the Instrument Status dialog or Instrument Toolbar.

The buttons on this dialog are:

Table XY Settings. Selecting this button displays the Table XY Settings dialog, which controls the amount of movement of the Table in the, X and Y axes. To move the table, an appropriate figure must be entered in this field. Once entered and OK is selected the Table will move by the specified amount each time one of the Nudge controls is activated. The default of the Centring (X/Y) Step Size field is 0.1mm.

Nudge –X+Y. Selecting this button causes the 'X' motor to be driven in a negative direction and the 'Y' motor to be driven in a positive direction for centring. Both motors being moved by a pre-determined distance set in the Table XY Settings dialog.

Nudge +Y. Selecting this button causes the 'Y' motor to be driven in a positive direction for centring. The motor being moved by a predetermined distance set in the Table XY Settings dialog.

Nudge +X +Y. Selecting this button causes the 'X' and 'Y' motors to be driven in a positive direction for centring. Both motors being moved by a predetermined distance set in the Table XY Settings dialog.

Nudge –X. Selecting this button causes the 'X' motor to be driven in a negative direction for centring. The motor being moved by a predetermined distance set in the Table XY Settings dialog.

Nudge +X . Selecting this button causes the 'X' motor to be driven in a positive direction for centring. The motor being moved by a predetermined distance set in the Table XY Settings dialog.

Nudge –X –Y. Selecting this button causes both the 'X' and 'Y' motors to be driven in their negative direction for centring. Both motors being moved by a predetermined distance set in the Table XY Settings dialog.

Nudge –Y. Selecting this button causes the 'Y' motor to be driven in a negative direction for centring. The motor being moved by a predetermined distance set in the Table XY Settings dialog.

Nudge +X –Y. Selecting this button causes the 'X' motor to be driven in a positive direction and the 'Y' motor to be driven in a negative direction for centring. Both motors being moved by a predetermined distance set in the Table XY Settings dialog.

Table Move (X-Y) Device Control

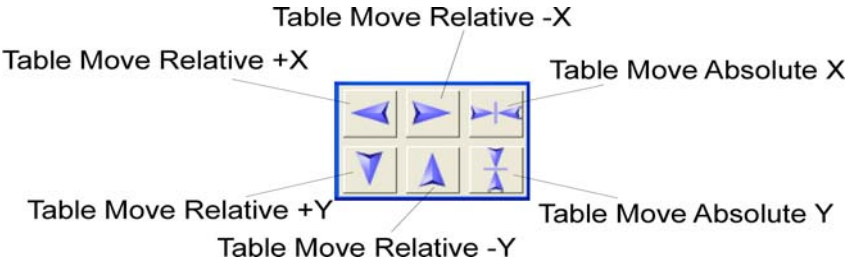


Table Move Relative -X
Table Move Relative +X
Table Move Absolute X
Table Move Relative +Y
Table Move Absolute Y
Table Move Relative -Y

This control is used for positioning the X-Y stage on the TR4/450

Selected by:

- Clicking on **Talyrond>Control>Table (X-Y)**.
- ***NB The option will be 'ticked' if the dialog is already open.***

Or

- Clicking on **Talyrond>Instrument Status** dialog, double clicking on the Centring and Levelling icon.

Or

- Right mouse clicking on the Centring and Levelling icon in the Instrument Status dialog and selecting Control.

The buttons on this dialog are:

Table Move Relative +X. Selecting this button displays the Table Move Relative +X dialog, which controls the amount of movement of the Table in the positive X direction (to the right looking at the front of the instrument). The default of the X Distance field is 0mm therefore to move the table, an appropriate figure must be entered in this field.

Table Move Relative -X. Selecting this button displays the Table Move Relative -X dialog, which controls the amount of movement of the Table in the negative X direction (to the left

looking at the front of the instrument). The default of the X Distance field is 0mm therefore to move the table, an appropriate figure must be entered in this field.

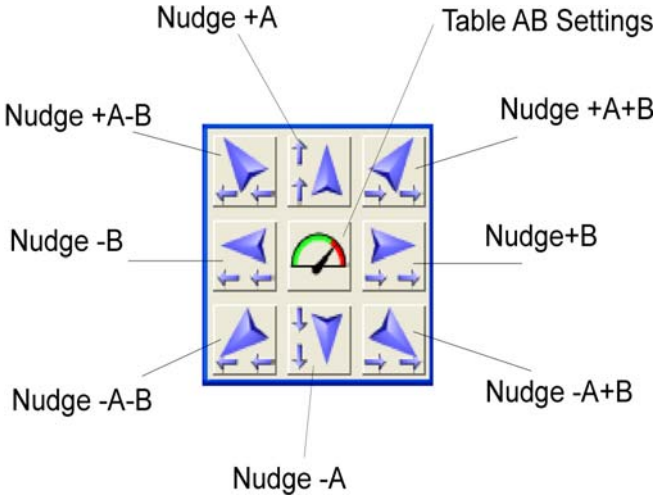
Table Move Absolute X. Selecting this button displays the Table Move Absolute X dialog, which controls the absolute movement of the Table in the X direction. The default of the Table X Position field is the current position of the Table, therefore to move the Table to an absolute position that position must be entered.

Table Move Relative +Y. Selecting this button displays the Table Move Relative +Y dialog, which controls the amount of movement of the Table in the positive Y direction (to the left looking at the right hand end of the instrument). The default of the Y Distance field is 0mm therefore to move the table, an appropriate figure must be entered in this field.

Table Move Relative -Y. Selecting this button displays the Table Move Relative -Y dialog, which controls the amount of movement of the Table in the negative Y direction (to the right looking at the right hand end of the instrument). The default of the Y Distance field is 0mm therefore to move the table, an appropriate figure must be entered in this field.

Table Move Absolute Y. Selecting this button displays the Table Move Absolute Y dialog, which controls the absolute movement of the Table in the Y direction. The default of the Table Y Position field is the current position of the Table, therefore to move the Table to an absolute position that position must be entered.

Table Levelling (A-B) Device Control



Selected by;

- Clicking on **Talyrond>Control>Table**.
- ***NB The option will be 'ticked' if the dialog is already open.***

Or

- Clicking on **Talyrond>Instrument Status** dialog, double clicking on the Centring and Levelling icon.

Or

- Right mouse clicking on the Centring and Levelling icon in the Instrument Status dialog and selecting Control.

The buttons on this dialog are:

Table A-B Settings. Selecting this button displays the Table A-B Settings dialog, which controls the amount of movement of the Table in the, X and Y axes. To move the table, an appropriate figure must be entered in this field. Once entered and OK is

selected the Table will move in steps by the specified amount. The default of the Levelling (AB) Step Size field is 0.1mm.

Nudge +A –B. Selecting this button causes the 'A' motor to be driven in a positive direction and the 'B' motor in a Negative direction for levelling. Both motors being moved by a predetermined distance set in Table A-B Settings dialog.o

Nudge +A . Selecting this button causes the 'A' motor to be driven in a positive direction for levelling. The motor being moved by a predetermined distance set in the Table A-B Settings dialog.

Nudge +A +B. Selecting this button causes the 'A' and 'B' motors to be driven in a positive direction for levelling. Both motors being moved a predetermined distance set in the Table A-B Settings dialog.

Nudge –B. Selecting this button causes the 'B' motor to be driven in a negative direction for levelling. The motor being moved by a predetermined distance set in the Table A-B Settings dialog.

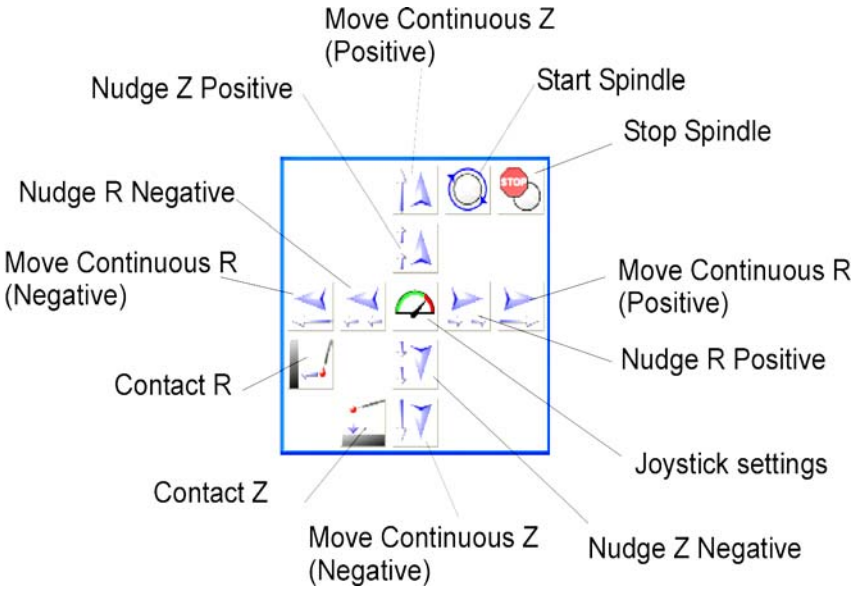
Nudge +B. Selecting this button causes the 'B' motor to be driven in a positive direction for levelling. The motor being moved by a predetermined distance set in the Table A-B Settings dialog.

Nudge –A –B. Selecting this button causes the 'A' and 'B' motors to be driven in negative direction for levelling. Both motors being moved by a predetermined distance set in the Table A-B Settings dialog.

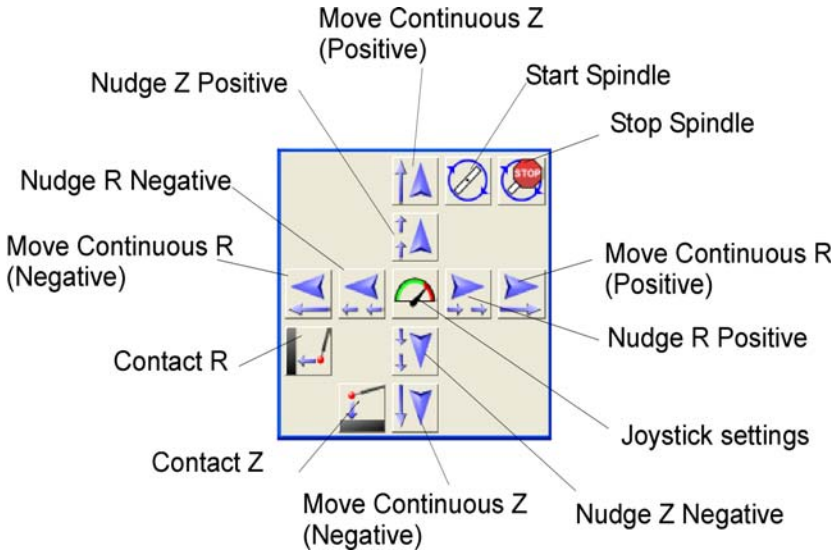
Nudge –A. Selecting this button causes the 'A' motor to be driven in a negative direction for levelling. The motor being moved by a predetermined distance set in the Table A-B Settings dialog.

Nudge –A +B. Selecting this button causes the 'A' motor to be driven in a negative direction and the 'B' motor in a positive direction for levelling. Both motors being moved by a predetermined distance set in the Table A-B Settings dialog.

Joystick (On-Screen)



OR (TR4/450)



Selected by:

- Clicking on **Talyrond>Control>Joystick**.

NB The option will be 'ticked' if the dialog is already open.

CAUTION

1. Take extreme care if you are moving the stylus away from the component and there is any obstruction to the movement (for example, if the stylus is inside a hole or tube). If the stylus meets any obstruction under these conditions it will snap off because there is no automatic protection mechanism for a stylus which is moving away from the component.
2. If, when you switch the system on, the stylus has been left in contact with the component, you must raise the stylus clear of the surface before using Move Contact. Failure to do this may cause damage to the instrument.

The buttons on this dialog are:

Joystick Settings. Selecting this button displays the Joystick Settings dialog, which controls the speed of continuous movement of the R and Z axes when using the Joystick. Select the required speeds from the drop down menus.

N.B. Where an instrument has only one speed in either axes the R Speed and Z Speed fields will be greyed out on the default speed.

Move Continuous Z (Positive). Selecting this button moves the Z axis in the positive direction until the button is released.

Nudge Z (Positive). Selecting this button causes the smallest permissible positive direction move in the Z axis.

Nudge R (Negative). Selecting this button causes the smallest permissible negative direction move in the R axis.

Move Continuous R (Negative). Selecting this button moves the R axis in the negative direction until the button is released.

Contact R. Assuming that the gauge setting is correct for this action, selecting this button moves the axis in the contact direction to bring the gauge into contact with a surface at the centre of its range.

Contact Z. Assuming that the gauge setting is correct for this action, selecting this button moves the axis in the contact direction to bring the gauge into contact with a surface at the centre of its range.

Move Continuous Z (Negative). Selecting this button moves the Z axis in the negative direction until the button is released.

Nudge Z (Negative). Selecting this button causes the smallest permissible negative direction move in the Z axis.

Move Continuous R (Positive). Selecting this button moves the R axis in the positive direction until the button is released.

Nudge R (Positive). Selecting this button causes the smallest permissible positive direction move in the R axis.

Start Spindle. Selecting this button displays the Start Spindle dialog. Select the desired direction and speed and then select OK to start the spindle.

Stop Spindle. Selecting this button will stop the spindle although manual clockwise movement is possible once the spindle has stopped.

Joystick Toolbar

This is a docking toolbar that can be docked at either of the vertical edges of the Ultra window. It contains the most commonly used controls for the instrument as shown on the on-screen joystick. The functions of the individual controls are as described under Joystick (On-screen).

Instrument Toolbar

Selected by:

- Clicking on **Talyrond>Instrument Toolbar**.

Note. This presents a toolbar, docked above the status bar, containing the instrument status icons and the most commonly used controls of the instrument.

Immediately below each icon is a numeric read-out of the position of that device.

The gauge icon also provides information on the attitude of the gauge, the direction of travel in both the horizontal and vertical and whether or not the gauge is underrange or overrange.

Right Mouse Clicking on any of the numbers below the icons on the Instrument Status View displays a pop-up menu containing a number of options relating to the instrument settings.

Right mouse clicking on an icon displays a pop-up menu, containing options relevant to the particular item.

Stop Control

Selected by:

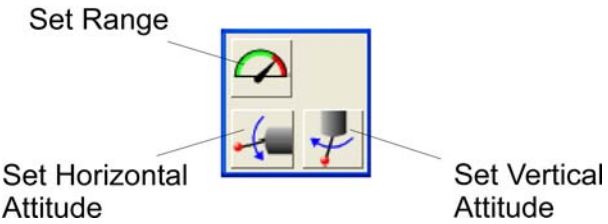
- Clicking on **Talyrond>Control>Stop Control**.

NB the option will be 'ticked' if the dialog is already open.

This dialog is used to stop the movement of the major axes, eg arm, column and spindle.

Caution. In the event of an emergency, the stop button should be used rather than this software control.

Gauge



Selected by;

- Clicking on **Talyrond>Control>Gauge**.

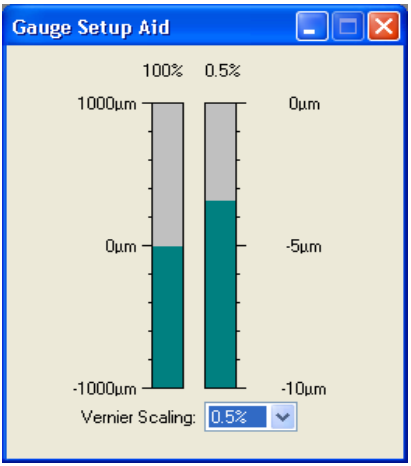
NB The option will be 'ticked' if the dialog is already open.

Set Range. Selecting this button displays the Set Range dialog. This dialog is used to set the Gauge Range/Resolution. The default of the Range field is the last entered range. Select the Range required from the drop down menu and select OK.

Set Horizontal Attitude. Selecting this button displays the Set Horizontal Attitude dialog, which sets the Horizontal Attitude and Contact Direction of the Gauge. The default of the Horizontal Attitude is the last entered Contact Direction. Select the required Contact Direction from the drop down menu and select OK.

Set Vertical Attitude. Selecting this button displays the Set Vertical Attitude dialog, which sets the Vertical Attitude and Contact Direction of the Gauge. The default of the Vertical Attitude is the last entered Contact Direction. Select the required Contact Direction from the drop down menu and select OK.

Gauge Setup Aid



The Gauge Setup aid shows the gauge displacement in two Vernier style bar graphs. The left hand graph shows the full range of the

gauge as currently selected. The right hand graph shows a percentage of the gauge range, as selected by the Vernier Scaling list box. This allows the sensitivity of the Vernier scale to be adjusted to meet your current requirements.

Selected by:

Right mouse click on the gauge icon and select Setup.

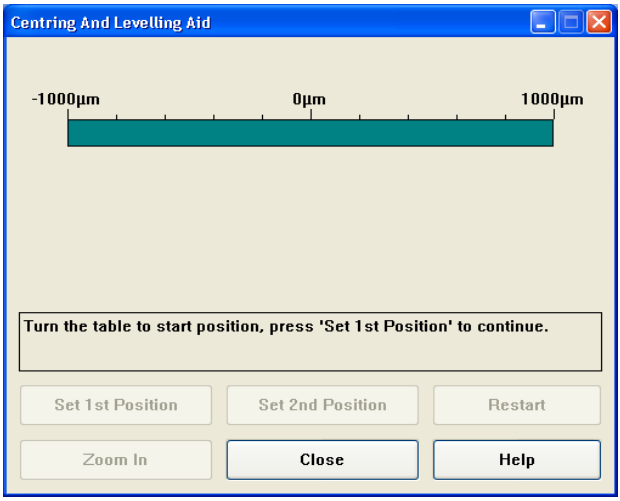
OR

Click on **Talyrond>Control>Gauge Setup Aid**.

The centre point on the left-hand scale is the gauge null position. The scale above and below this point is derived from which gauge is fitted. The right hand scale is a vernier scale related to the left-hand one in that it displays the least significant digits on a scale that can be selected on the dialog. The scale is expressed in terms of its percentage of the scale on the left.

To change the scale, click in the drop down box to reveal the pre-defined scales available and choose one of them. The percentages are 10%, 5%, 2%, 1% and 0.5%.

Centring and Levelling Aid



The Centring And Levelling Aid is used to help Centre and Level components on instruments with a manual Centring and Levelling Table.

Selected by;

- Clicking on **Talyrond>Control>Centring And Levelling Aid**.

NB The option will be greyed out if the dialog is already open.

OR

- Clicking on **Talyrond> Instrument Status**,and double clicking on the Centring & Levelling icon.

OR

- Right mouse clicking on the Centring & Levelling icon in the Instrument Status dialog.

The instructions for using the aid are displayed on the Centring And Levelling Aid dialog at each step.

Operating Ultra Roundness

After configuring the software as detailed in Chapter 6, the instrument is now ready for more specific setting up and subsequent use.

Setting End stops

Some instruments support the setting of software end-stops. These work in a similar fashion to electro-mechanical endstops, limiting the range of movement of the particular axis.

Cancel. Selecting this option will reset both the R and Z end-stops to the physical endstop positions allowing the full range of motion of the instrument.

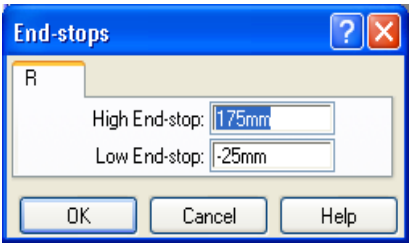
R. Selecting this option displays the End-stops dialog for the R axis. To set the end stop positions, enter the values for the positions into the appropriate boxes and press OK. Note that the values entered should be in the currently used Co-ordinate System.

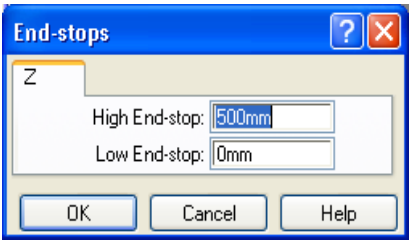
Z. Selecting this option displays the End-stops dialog for the Z axis. To set the end stop positions, enter the values for the positions into the appropriate boxes and press OK. Note that the values entered should be in the currently used Co-ordinate System.

Note that if the UCS is changed, these positions will be automatically updated to reflect the new UCS settings and the physical

positions at which the software endstops activate will remain unchanged.

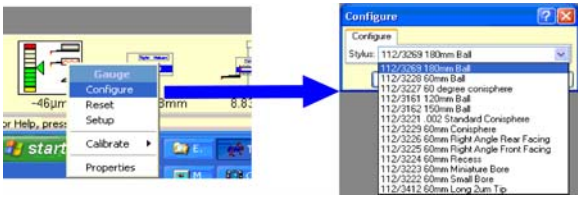
To set the end-stops, click on **Talyrond>Instrument>End-stops** and select **R**, **Z** or **Cancel**. Enter the High and Low End Stop values and click OK.





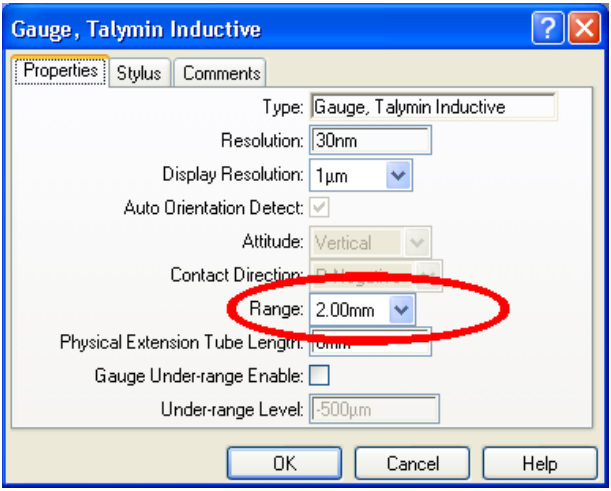
Selecting the Stylus

To select the stylus, Right mouse click on the Gauge icon and select Configure. Select the stylus on the dialog and click OK.



Selecting the Gauge Range

To select the gauge Range , Right Mouse Click on the gauge icon, select Properties and set the Range, click OK.



Gauge/Stylus Calibration

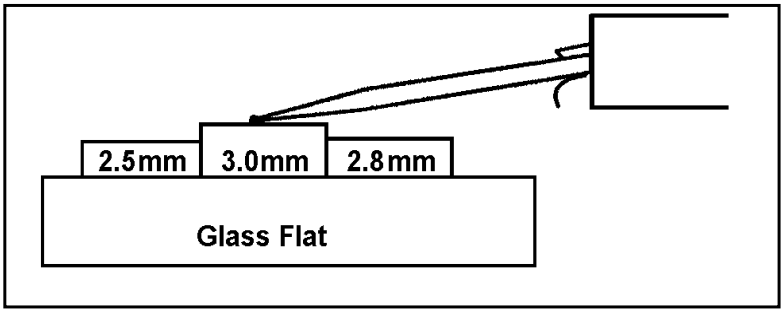
Using Slip blocks

Note. When using slip blocks to calibrate the gauge, it is good practice to lower the stylus from the null position by half the step height e.g. For Range 1, the gauge reading below the gauge icon on the Instrument Status dialog is +250mm). This is to ensure that the Gauge is calibrated symmetrically about the null position.

2mm or 0.4mm Gauge Range.

- Ensure that the table is in the 'Home' position and apply the spindle clamp (Not applicable to TR4).

- Set the attitude and orientation to, Horizontal and Down (TR4 - Set the attitude and orientation to, Vertical and Z Negative).
- Wring the slip blocks (2.8mm, 3mm and 2.5mm) onto the glass flat and place under the gauge, bring the stylus into position just above and towards the edge of the 3mm slip block.



- Select Talyrond>Instrument Status. Right mouse click on the top of the gauge icon and select Properties. Select the appropriate gauge range i.e. 2mm or 0.4mm. Select OK.
- Using the Device Control dialog for the column, select contact and check that the stylus is in contact with the 3mm slip block. On the Device Control dialog, select Move Relative Z (Negative). Enter half the step height for the range being calibrated i.e.0.1mm for the 0.4mm range or 0.25mm for the 2mm range. Select OK.
- In the Instrument Status dialog, right mouse click on the top of the gauge icon and select Calibrate>New. Select the name of the Calibration Standard that is currently in use or select a New Standard if one does not already exist. Select OK.
- If a new standard is selected, select the calibration component type on the dialog and give it an appropriate name. Select OK . Check that the correct standard type is displayed and enter the correct Step Height. Select OK and on the Perform Calibration tab, choose the required Gauge Range, and select OK.

Note. Do not check the Contact Before Measurement checkbox.

- A Confirm dialog is displayed asking the user to Move gauge to first step, select OK, a further Confirm dialog is displayed asking the user Move gauge to other step. Slide the glass so that the stylus drops onto the second surface, select OK. When the calibration is complete another Confirm dialog is displayed, follow the instructions on the dialog. Selecting Yes will store the calibration constant.

0.08mm Gauge Range.

- Ensure that the table is in the 'Home' position and apply the spindle clamp. Set the attitude and orientation to Horizontal and Down. Wring the Slip Blocks (3mm and 2.96mm) onto the glass flat and place under the gauge, bring the stylus into position just above and towards the edge of the 3mm slip block.
- Select Talyrond>Instrument Status. Right mouse click on the top of the gauge icon and from the drop down menu select Properties. Select the gauge range 0.08mm. Select OK.
- Using the Device Control dialog for the column, select contact and check that the stylus is in contact with the 3mm slip block. On the Device Control dialog, select Move Relative Z (Negative). Enter 0.1mm and select OK. On the Device Control dialog, select Move Relative Z (Positive). Enter 0.08mm. Select OK.
- In the Instrument Status dialog, right mouse click on the top of the gauge icon and select Calibrate>New. Select the name of the Calibration Standard that is currently in use or select a New Standard if one does not already exist. Select OK.
- If a new standard is selected, select the calibration component type on the dialog and give it an appropriate name. Select OK . Check that the correct standard type is displayed and enter the correct Step Height. Select OK and on the Perform Calibration tab, choose the required Gauge Range, and select OK.

Note. Do not check the Contact Before Measurement checkbox.

- A Confirm dialog is displayed asking the user to Move gauge to first step, select OK, a further Confirm dialog is displayed asking the user Move gauge to other step. Slide the glass so that the stylus drops onto the second surface, select OK. When the calibration is complete another Confirm dialog is displayed, follow the instructions on the dialog. Selecting Yes will store the calibration constant.

Using the Flick Standard

- Centre and Level the Centring and Levelling Table.

Note. To calibrate the gauge, use a 300mm Flick Standard for both the 0.4mm and 2.0mm Ranges. For the 0.8mm Range (TR290) use the 20mm Flick Standard.

- Select Talyrond>Instrument Status, right mouse click on the top of the gauge icon and select Calibrate.
- Select New. Select the name of the Standard that is currently in use or select a New Standard if one does not already exist.
- Select OK, select the calibration component type and give it an appropriate name, select OK
- Check that the correct standard type is displayed and enter the correct Flat Depth.
- Select OK, select the Perform Calibration tab and choose the required Gauge Range, select OK. This will then start the calibration which when complete will display a window showing a Raw Profile view.

Setting Resistive and Phase Balance (Talyrond 73 only)

Initial settings.

- Set the gauge to "Ext", adjusting the bias knob as necessary, and set the Gauge Properties on the software to "Vertical, R

negative". Select the widest gauge range (e.g. 1.27mm for a standard 63.5mm stylus arm).
- Centre a suitable component (e.g. flick standard) on the work-table.
- Turn off the spindle and rotate it to its zero degree position.
- Note that a narrow bladed parallel tipped, plain screwdriver is required for the purposes of adjusting the potentiometers (pots) on the RIU.

Set the Resistive balance.

- Right Mouse Click on gauge icon. Select Calibrate/Resistive Balance. The lights on the RIU will light. Use the centring controls to bring the gauge to about zero. Use the fine centring control to move the gauge deflection slowly through zero whilst watching the lights, and find the point at which the lights are at minimum intensity. Adjust the R pot until both lights go out. Note that it might be necessary to refine the gauge deflection during this operation to find the null point.
- Once both lights are extinguished, OK the dialog.

Set the Phase balance.

- Right Mouse Click on gauge icon. Select Calibrate/Phase Balance. The lights on the RIU will light. Use the centring controls to bring the gauge deflection between the limits indicated on the dialog, and search for a minimum intensity on the red light. Adjust the "P" pot until a minimum intensity is achieved on the red LED. Repeat this procedure, refining the position of the pot and the gauge deflection, until both lights are extinguished.
- Once the lights are extinguished, OK the dialog.

Testing the balance.

- It is not necessary to test the balance further, however an automated test routine is provided if this should be felt necessary. With the gauge in its current position, adjust the centring knob to bring the gauge deflection just into gauge over-range.
- Right Mouse Click on gauge icon. Select Calibrate/Test Balance. The lights on the RIU will light. The gauge deflection should now show gauge under-range. OK the dialog, and either switch on the spindle at its measuring speed, or slowly rotate the gauge round the component by hand. Gauge deflection must go through the null (zero) position during this operation as the system will remain in balance testing mode until the gauge ~ses through the null position. The lights on the RIU should extinguish as the null position is passed, a dialog will be presented to indicate if the gauge balance is correct, or incorrect as appropriate.

Setting Resistive and Phase Balance (Talyrond 131 only)

- Ensure that the Gauge has been calibrated.
- Place a component centrally on the Centring and Levelling table, using the concentric lines on the table as a guide.
- Select Talyrond>Instrument Status. Right mouse click the gauge icon and select Calibrate. From the drop down menu select Resistive Balance and follow the instructions on the dialog.
- Right mouse click the gauge icon and from the drop down menu select Calibrate. From the drop down menu select Phase Balance and follow the instructions on the dialog.

Setting Resistive and Phase Balance (Talyrond 265/240/4/450 only)

- Ensure that the Gauge has been calibrated.
- Place a component centrally on the Centring and Levelling table offset by 0.5mm.
- Set the Gauge to the appropriate attitude and contact direction and bring it into contact with the component.
- Select Talyrond>Instrument Status. Right mouse click towards the top of the gauge icon and select Calibrate. From the drop down menu select Resistive Balance, the Gauge Talymin Inductive dialog will be displayed follow the instructions on the dialog.
- Select OK the Gauge Talymin Inductive dialog will be redisplayed read the instructions on the dialog. Select OK and carry out the instructions.
- Right mouse click the gauge icon and from the drop down menu select Calibrate. Select Phase Balance and follow the instructions on the dialog. Select OK, the Gauge Talymin Inductive dialog will be redisplayed read the instructions on the dialog. Select OK and carry out the instructions.
- Right mouse click the gauge icon and from the drop down menu select Calibrate. Select Test Balance. The Gauge Talymin Inductive is displayed follow the instructions. Select OK the Gauge Talymin Inductive dialog is redisplayed with the message Resistive and Phase Balance passed (1902) if the resistive and phase balance tests have been successful.

Setting Resistive and Phase Balance (Talyrond 290/295/400/440 only)

- Ensure that the Gauge has been calibrated.
- Place a component centrally on the Centring and Levelling table offset by 0.5mm.

- Select Talyrond>Instrument Status. Right mouse click towards the top of the gauge icon and select Calibrate.
- Select Auto-Balance from the drop down menu. The Gauge, Talymin Inductive dialog is displayed, taking note of the Warning follow the instructions on the dialog.

Manual Centre and Level

Note. Ensure that the Gauge has been Calibrated and the Phase and Resistive Balance checks have been carried out before making a measurement.

Centring and levelling the Workpiece is carried out in three stages:

Stage 1 - Coarse visual centring.

- Set the turntable centring and levelling knobs to their mid position.
- Place the workpiece, centrally on the turntable using the concentric circles as a guide.
- Select Talyrond>Instrument Status. Right mouse click on the gauge icon and select Properties. In the range field select Range 2.0mm.
- Set the gauge attitude and contact direction to the required position, if the Auto Orientation Detect option is not selected in the Gauge dialog the gauge Attitude and Orientation and Contact Direction will need to be confirmed.
- Move the pick-up to a height of 20mm above the table or as near as possible to this height.
- Radially adjust the pick-up until the stylus is near the surface to be measured. Rotate the turntable manually and observe the variation in the gap between the stylus and workpiece; if necessary improve the centrality by gently tapping the workpiece with, for example, the handle of a screwdriver.

- Rotate the turntable so that one of the centring knobs is next to the column e.g. 0°. Move the pick-up until the stylus contacts the workpiece and the pointer of the centring meter is in the centre position. Rotate the worktable through 180° and note the swing of the meter pointer. Halve the error as shown on the meter by adjusting the centring knob, which is now opposite the column.
- Repeat the procedure with the other centring knob. Check that the original centring adjustment has not varied. If this has occurred, repeat the procedure, first with one centring knob then with the other, until the meter swing remains within the limit marks of the meter.

Stage 2 - Intermediate Centring using the Centring And Levelling Aid.

- In the Instrument Status dialog right mouse click on the centring and levelling icon and select the Setup option. The Centring And Levelling Aid is displayed follow the instructions in the dialog.

Stage 3 - Fine centring.

- Once the workpiece is centred in the Range 2mm, the Range 0.4mm can be selected and the centring process repeated using the Centring And Levelling Aid.
- Once the component is centred the levelling process can be undertaken.
- Move the gauge to a position as near as possible to the top of the component and move into contact so that the gauge is in mid-range.
- The component should be level within the swing of the meter as it rotates. If this is not the case continue with the process defined below. If this is the case, ignore the next two steps.
- Rotate the turntable so that one of the levelling knobs is next to the column. Move the pick-up until the stylus contacts the

workpiece and the pointer of the centring meter is in the mid position. Rotate the worktable through 180° and note the swing of the meter pointer. Halve the error as shown on the meter by adjusting the levelling knob that is now opposite the column.

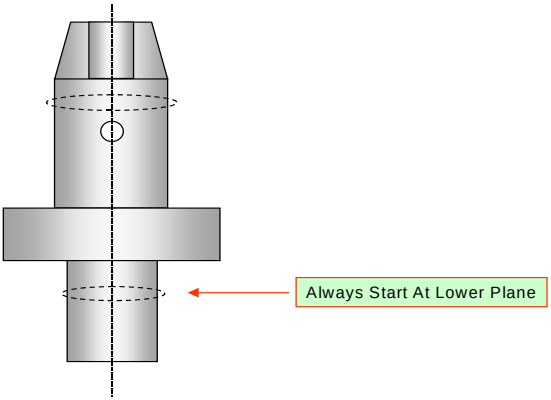
- Repeat the procedure with the other levelling knob. Check that the original levelling adjustment has not varied. If this has occurred, repeat the procedure, first with one levelling knob then the other, until the meter swing remains within the limit marks.
- On the Instrument Status dialog right mouse click on the centring and levelling icon and select the Setup option. The Centring And Levelling Aid is displayed follow the instructions in the dialog.
- Once the levelling is complete it may be necessary to go back to the first position for centring and re-adjust to ensure precise centring.

Automatic Centre and Level

This procedure requires two roundness measurements to be made on a component, one close to the base and one close to the top. From the measurement data, the tilt of the component axis with respect to the axis of the worktable spindle is calculated. The appropriate corrections are then applied to adjust the position of the worktable to bring the axis of the component coincidental with the axis of the spindle.

- Set the gauge in an attitude and contact direction suitable for making the measurements required.
- Select Talyrond>Instrument Status. Right mouse click on the centring and levelling icon. Select Home>All. The Centring and Levelling Table will now be moved to the 'Homed' position.

- Place, a component in a central position on the worktable, positioning the component by eye and using the concentric rings on the worktable as a guide.
- Use the joystick to position the stylus level with the component, as near as possible to its base. The stylus tip should be close to, but not in contact with the component.



- Right mouse click on the gauge icon and select Properties. Select Range 2.0mm and then select OK.
- Right mouse click on the centring and levelling icon select Auto Centre and Level or click on the auto centre and level icon. Check that the information in the fields is correct for the measurement required and enter a target eccentricity and maximum number of iterations.

Note. You can specify that the stylus contacts before measure automatically by selecting Contact before Measure on the dialog or you can deselect this, which will require manual contacting. You can also specify a distance that the stylus will move away from the surface after the end of the measurement.

Note. The first (lower) roundness plane will be measured at the current height. The second (upper) roundness plane will be measured at a height above the first plane as specified by the 'Plane Separation' text field.

- Select OK. When the measurement cycle has finished, a cylinder will be analysed and its eccentricity calculated. Ultra will then determine and execute the required adjustments to the centring and levelling motors.
- The complete measure, analyse and adjust sequence will be repeated until either the target eccentricity has been obtained or the maximum number of iterations has been reached. Position stylus at lower plane

Automatic Centre and Level (TR4)

- Set the gauge in an attitude and contact direction suitable for making the measurements required.
- Place, a component on the ‘X’ axis of the worktable, underneath the spindle axis.
- Use the joystick to position the stylus level with the component, as near as possible to its base. The stylus tip should be close to, but not in contact with the component.
- Right mouse click on the gauge icon and select Properties. Select Range 2.0mm and then select OK.
- Right mouse click on the centring and levelling icon and select Auto Centre and Level. Check that the information in the fields is correct for the measurement required and enter a target eccentricity and maximum number of iterations.

Note. You can specify that the stylus contacts before measure automatically by selecting Contact before Measure on the dialog or you can deselect this, which will require manual contacting. You can also specify a distance that the stylus will move away from the surface after the end of the measurement.

Note. The first (lower) roundness plane will be measured at the current height. The second (upper) roundness plane will be measured at a height above the first plane as specified by the 'Plane Separation' text field.

- Select OK. When the measurement cycle has finished, a cylinder will be analysed and its eccentricity calculated. Ultra will then determine and execute the required adjustments to the centring and levelling motors.
- The complete measure, analyse and adjust sequence will be repeated until either the target eccentricity has been obtained or the maximum number of iterations has been reached.

Measurement options

Selecting a Working Folder

Click on View>Folders and click on the chosen folder, click on the green tick icon to select folder.

Measurement Settings

- Move gauge to required Attitude & Orientation. This will depend upon the instrument as to whether this is achieved through the Gauge dialog, see page 7-20 or manually.
- Position Stylus where required.
- Right Mouse Click on the Gauge icon and select Properties. Select the Attitude and Contact direction on the dialog and click OK.
- Contact the stylus and enter the Arm (R) and Column (Z) positions from the scales if required to do so (Talyron 130 and 131).
- Select Measurement Type. See Roundness, Cylindricity, Flatness, Multiplane Flatness, Horizontal Straightness and Parallelism as appropriate.

Note: Your instrument may not be able to perform all these measurement options, the software will let you only do what is appropriate for your instrument.

Measure Dialogs

The Measure dialogs contain the settings for a requested measurement, there is a separate Measure dialog for each type of measurement. When you select OK on the dialog or as soon as you press Enter on the keyboard the instrument carries out a measurement with the settings as displayed.

Auto-name. With the Auto-name box checked, the analysis keeps the same name as the measurement but is numbered in sequence. Used on all measurement dialogs.

Measurement Name. With the Auto-name box unchecked, the measurement can be given a specific name. Used on all measurement dialogs.

Immediate. When this field is checked, the instrument will start from its current position, and after moving the specified run-up length will start to measure. Used on Vertical Straightness, Horizontal Straightness, Cylinder and Multiplane Flatness dialogs.

Arc Length (Roundness). The Arc length defines the angilar arc length over which the measurement is to be made. Used on Partial Roundness and Partial Flatness .

Measurement Direction. This is the direction in which the Arm will traverse when a measurement is being made. Used on all measurement dialogs.

Measurement Start Position. The Measurement Start Position, is the absolute position on the column or the arm where the measurement is to start. This field is only used if the 'Immediate' box is not checked. Used on Multiplane Flatness, Horizontal Straightness and Cylindricity.

Data Length. Data Length specifies the length over which the measurement will take. The analysis will begin from the Selected Area start position if one has been set. It is independent of the start position. Used on Vertical Straightness and Horizontal Straightness.

Run-Up Length. This is the amount the Arm will move before it starts measuring. It applies to both the Immediate and Measurement Start Point. The Arm will go back beyond the Start Position, (if the 'Immediate' box is unchecked) specified in the Measurement Start Position. Users are strongly advised to keep this to 0.3mm. Used on Vertical Straightness and Horizontal Straightness.

Measurement Speed. Measurement speed is the speed at which the measurement axis moves during measurement. The spindle can be rotated at either 2rpm or 6rpm and these speeds are used on Roundness, Cylindricity, Flatness and Multiplane Flatness measurements.. The column and arm can both move at the following speeds 1mm/s, 2.5mm/s, 5mm/s and 10mm/s and can be used when measuring Vertical or Horizontal Straightness. When measuring Vertical or Horizontal Straightness the spindle is automatically clamped.

Number of Planes. When measuring Multiplane Flatness or Cylindricity the number of planes to be measured can be set in this field. The maximum number of planes that can be set is 10 for Multiplane Flatness and 20 for Cylindricity. Used on Multiplane Flatness and Cylindricity.

Plane Spacing. When measuring in Multiplane Flatness or Cylindricity the spacing between the planes to be measured can be set in this field. Used on Multiplane Flatness and Cylindricity.

Range. The range field allows the user to set the range of the Gauge. The 2mm range gives a gauge movement of ±1mm from the null position and the 0.4mm range, a gauge movement of ±0.2mm from the null position. Used on all measurement dialogs.

Contact Before Measure. When the Contact Before Measure box is checked the Column Carriage or Arm will be driven automatically so that the gauge is in its null position. Uncheck this box to move the gauge into contact manually. Used on all measurement dialogs.

Move Off Surface After Measure. When the Move Off Surface After Measure box is checked the Column Carriage or Arm is moved away from the component automatically after measurement, by a specified distance. Used on all measurement dialogs.

Display Measurement. When this box is checked the measurement results are automatically displayed after the measurement. If the box is unchecked the results will not be shown. Used on all measurement dialogs.

Measurement descriptions

Roundness

- From the Measurement Toolbar select Roundness.
- Click the GO button.
- Insert the details of the measurement required. Select OK.

Cylindricity

- From the Measurement Toolbar select Cylinder.
- Click the GO button.

- Insert the details of the measurement required (for a cylindricity measurement a minimum of two planes must be selected). Select OK.

Flatness

- From the Measurement Toolbar select Flatness.
- Click the GO button.
- Insert the details of the measurement required and select OK.

Multiplane Flatness

- From the Measurement Toolbar select Flatness.
- Click the GO button.
- Insert the details of the measurement required (for a multiplane flatness measurement a minimum of two planes must be selected). Select OK.

Horizontal Straightness

- From the Measurement Toolbar select Horizontal Straightness.
- Click the GO button.
- Insert the details of the measurement required. Select OK.

Parallelism

- Select the side of the component to be used as the parallelism datum.
- From the Measurement Toolbar select Vertical Straightness.
- Click the GO button.
- Insert the details of the measurement required. Select OK.
- The Raw Profile will be displayed, select New Analysis on the Raw Profile toolbar or right mouse click on the profile panel and select **New>Analysis**.
- Select **Vertical Straightness>OK**.

- The modified profile will be displayed, right mouse click on the profile and select Set As Datum.
- The Set As Datum dialog will be displayed with the name of the current analysis displayed in the Name field. Select OK.
- Move the gauge to the opposite side of the component and carry out another Vertical Straightness measurement.

View Measurement

- The raw profile is displayed.

Analysis options

New Analysis Dialog

Auto-name. With the Auto-name box checked, the analysis keeps the same name as the measurement but is numbered in sequence. Used on all analysiss.

Analysis Name. With the Auto-name box unchecked, the analysis can be given a specific name.

Type. Defines the type of Analysis, ie Roundness, Crest, Harmonic or Roundness Groove.

Display Analysis. With the Display Analysis box checked the analysis is automatically displayed, with it unchecked the analysis is carried out in the background.

Roundness Analysis Settings

- Start the analysis by clicking on the New Analysis button located on the toolbar.
- Complete Dialogue Box and click on OK.

- Click on the Filter tab and choose the Filter Setting.
- Click on the Reference tab and choose the Reference Circle required, ie LS Circle, MZ Circle, MC Circle or MI Circle.
- Click on the Datum tab and choose the Datum.
- Click on the Parameters tab and Select the required Parameters. Click OK.
- View the results.

Crest Analysis

- Start the analysis by clicking on the New Analysis button located on the toolbar.
- Complete the dialog, ensuring that the Type is set to Crest. Click OK.
- Complete the dialog by selecting the required parameters and click OK.
- View the Analysis results.

Harmonics Analysis

- Start the analysis by clicking on the New Analysis button located on the toolbar.
- Complete the dialog, ensuring that the Type is set to Harmonics. Click OK.
- Set the Filter type and the Filter range.
- Click on the Amplitude tab and set the Discrimination level. Click OK

Note. The First Harmonic equates to the Eccentricity and the Second Harmonic to the Ovality.

- View the Harmonic Amplitude table.
- To view the Harmonic Phase table, right mouse click on the table and select **Display>Phase Table.**
- To view the Histogram of the Harmonic components, right mouse click on the table and select **Display>Histogram.** You

can zoom into the Histogram by double clicking on the Histogram.

Groove Analysis

Groove Analysis enables the user to analyse the shape, position and depth of grooved features on compnents being measured.

On the Groove-Analysis layout the grooves regions are shaded in purple with a red bisector. These purple regions overlay the Hole regions that are shaded in grey. These grey hole regions will typically lie either side of the purple groove regions.

It is possible that scratches can be detected as grooves of one data spacing width (0.1 degrees). When this happens only the red bisector is visible.

Groove edges may be moved or split by selecting the "+" or "-" groove edit buttons at the top of the layout and dragging the cursor on the layout (enabled by pressing the left mouse button).

Other regions may be removed from the analysis by User exclusions. Note that a User exclusion within a groove will not split it. As with the standard Roundness or Flatness software the User exclusion regions are added or removed by selecting the "+" or "-" or "remove all" groove edit buttons (shown here) at the top of the layout and dragging the cursor on the layout (enabled by pressing the left mouse button).

- Start the analysis by clicking on the New Analysis button located on the toolbar.
- Complete the dialog, ensuring that the Type is set to Roundness Grove. Click OK.
- Click on the Grooves tab and enter the threshold and edge level for the grooves.

- Click on the Filter tab and choose the Filter Setting.
- Click on the Reference tab and choose the Reference Circle required, ie LS Circle, MZ Circle, MC Circle or MI Circle.
- Click on the Datum tab and choose the Datum.
- Click on the Parameters tab and Select the required Parameters. Click OK.
- View the Analysis results.

Print

- Click on Print Icon

OR

- Select File>Print>Configure Printer and select OK

OR

- Right Mouse Click On Graph, select Print>Default (or chosen layout)

OR

- Select View>Folders and Right Mouse Click on File, select Print>Default (or chosen layout)

Re-Analysis and file handling

View an Old Measurement

- Click on View>Folders, navigate to file. Right Mouse Click on file name and click **Display>Default**.

OR

- Click on File>Open. Navigate to file and click Open.

OR

- Click on File Open icon . Navigate to file and click Open.

Analyse an Old Measurement

- Right Mouse Click on the Graph and click New>Analysis

OR

- Right Mouse Click on the file to be analysed and click New>Analysis

Chapter 8
Surface Operating Instructions

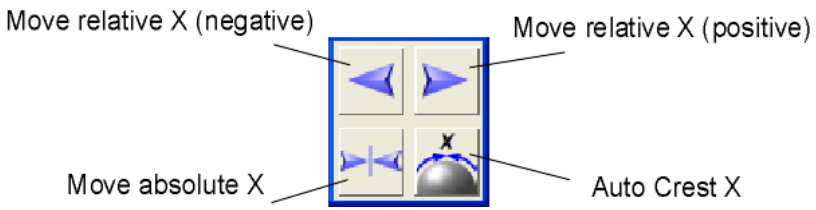
Introduction

The Operating Instructions are organised into a number of sub-sections to enable you to find the information required quite quickly.

The sub-sections of this chapter describe the major software controls and the main ‘How Do I’ operations to enable you to set up the instrument, make a simple measurement and then do more advanced operations with the instrument.

Major controls

Device Control Dialog for Traverse Unit (X)



Selected by:

- Clicking on **Form Talysurf>Control>Traverse (X)**.
  NB The option will be ‘ticked’ if the dialog is already open.

Or

- Right mouse clicking on the Traverse Unit icon and selecting Control.

Or

- Clicking on **Form Talysurf>Instrument Status**, double clicking on the Traverse Unit icon.

Caution. To avoid damage to the component or the stylus, it is recommended that the stylus is moved clear of the surface when initiating a move.

The buttons on this dialog are:

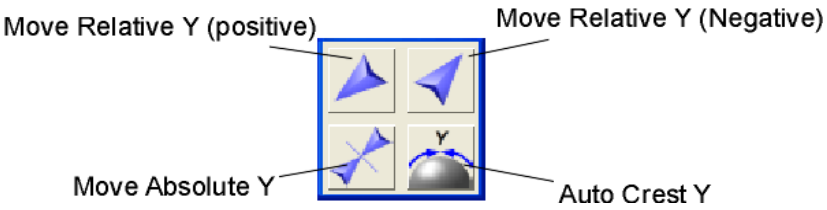
Move Relative X (Positive). This button opens the dialog which moves the traverse unit in the requested direction by a relative amount. The movement has its own dialog and the field on it is X Distance. To stop the movement before it reaches its destination, press the Stop button. Movement takes place at the default movement speed for the traverse unit, this being available to change through the Set Move Speeds option of the Joystick.

Move Relative X (Negative). This button opens the dialog which moves the traverse unit in the requested direction by a relative amount. The movement has its own dialog and the field on it is X Distance. To stop the movement before it reaches its destination, press the Stop button. Movement takes place at the default movement speed for the traverse unit, this being available to change through the Set Move Speeds option of the Joystick.

Move Absolute. This dialog moves the traverse unit to an absolute location which you specify, regardless of where it is at present The absolute movement will be with reference to the current coordinate system. To stop the movement before it reaches its destination, press the Stop button. Movement takes place at the default movement speed for the traverse unit, this being available to change through the Set Move Speeds option of the Joystick.

Auto crest X. This button opens the dialog that starts and controls the auto cresting function in the X direction. The dialog allows the setting of values for the precision of the cresting operation, the data length to be used, the run up length to be used and the measurement speed setting.

Device Control Dialog for Stage (Y)



Selected by:

- Clicking on **Form Talysurf>Control>Stage (Y)**.
  NB The option will be 'ticked' if the dialog is already open.

Or

- Right mouse clicking on the Stage (Y) icon and selecting Control.

Or

- Clicking on **Form Talysurf>Instrument Status**, double clicking on the Stage (Y) icon.

Caution. To avoid damage to the component or the stylus, it is recommended that the stylus is moved clear of the surface when initiating a move.

The buttons on this dialog are:

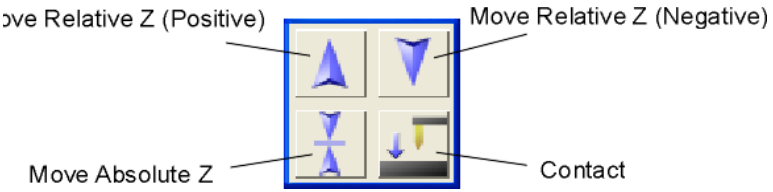
Move Relative Y (Positive). This button opens the dialog which moves the Y Stage in the requested direction by a relative amount. The movement has its own dialog and the field on it is Y Distance. Movement takes place at the default movement speed for the Y Stage, this being available to change through the Set Move Speeds option of the Joystick.

Move Relative Y (Negative). This button opens the dialog which moves the Y Stage in the requested direction by a relative amount. The movement has its own dialog and the field on it is Y Distance. Movement takes place at the default movement speed for the Y Stage, this being available to change through the Set Move Speeds option of the Joystick.

Move Absolute Y. This dialog moves the Y Stage to an absolute location which you specify, regardless of where it is at present The absolute movement will be with reference to the current co-ordinate system. Movement takes place at the default movement speed for the Y Stage, this being available to change through the Set Move Speeds option of the Joystick.

Auto crest Y. This button opens the dialog that starts and controls the auto cresting function in the Y direction. The dialog allows the setting of values for the precision of the cresting operation, the position of the initial cresting position, the data length to be used, and the spacing distance to be used.

Device Control Dialog for Column (Z)



Selected by:

- Clicking on **Form Talysurf>Control>Column (Z)**.
  NB The option will be 'ticked' if the dialog is already open.

Or

- Right mouse clicking on the Column icon and selecting Control.

Or

- Clicking on **Form Talysurf>Instrument Status** and double clicking on the Column icon.

The buttons on this dialog are:

Move Relative Z (Positive). This button opens the dialog which moves the column carriage in the requested direction by a relative amount. The movement has its own dialog and the field on it is Z Distance. To stop the movement before it reaches its destination, press the Stop button. Movement takes place at the default movement speed for the column carriage.

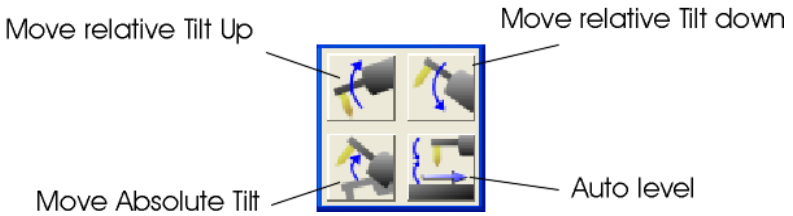
Move Relative Z (Negative). This button opens the dialog which moves the column carriage in the requested direction by a relative amount. The movement has its own dialog and the field

on it is Z Distance. To stop the movement before it reaches its destination, press the Stop button. Movement takes place at the default movement speed for the column carriage, this being available to change through the Set Move Speeds option of the Joystick.

Move Absolute Z. This dialog moves the traverse unit to an absolute location which you specify, regardless of where it is at present The absolute movement will be with reference to the current co-ordinate system. To stop the movement before it reaches its destination, press the Stop button. Movement takes place at the default movement speed for the column carriage, this being available to change through the Set Move Speeds option of the Joystick.

Move Column - Contact. This function controls movement in the Z axis and is called up from the device control dialog for the column. When you press this button the stylus moves into contact with the component at a pre-defined contact speed. The direction in which the contact move is made will be dependent on the selected stylus orientation. There is no control dialog for this function. To stop the movement before it reaches its destination, press the Stop button.

Device Control Dialog for Tilt



Selected by:

- Clicking on **Form Talysurf>Control>Tilt**.
  NB The option will be 'ticked' if the dialog is already open.

Or

- Right mouse clicking on the Tilt icon and selecting Control.

Or

- Clicking on **Form Talysurf>Instrument Status** and double clicking on the Tilt icon.

The buttons on this dialog are:

Move Relative Tilt Up. The button opens the dialog which tilts the traverse unit in the requested direction by a relative amount. The Movement has its own dialog and the field on it is Tilt Distance. To stop the movement before it reaches its destination, press the Stop button. Movement takes place at the default movement speed for the tilt.

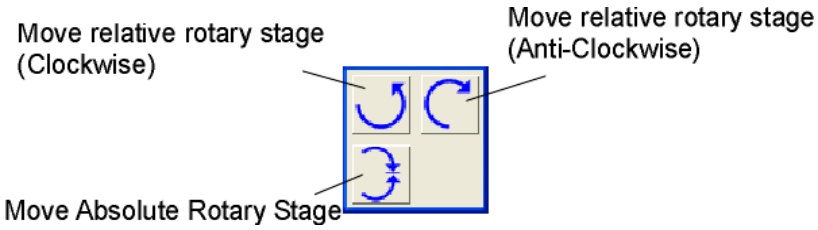
Move Relative Tilt Down. The button opens the dialog which tilts the traverse unit in the requested direction by a relative amount. The Movement has its own dialog and the field on it is Tilt Distance. To stop the movement before it reaches its destination, press the Stop button. Movement takes place at the default movement speed for the tilt, this being available to change through the Set Move Speeds option of the Joystick.

Move Absolute Tilt. This button opens the dialog which tilts the traverse unit to an absolute angle which you specify, regardless of where it is at present. A positive angle is always anti-clockwise from the horizontal and a negative angle is always clockwise. The absolute movement will be with reference to the current co-ordinate system. The line of the base unit is taken as the datum for tilt movement unless a tilt adapter is fitted. To stop the movement before it reaches its destination, press the Stop button. Movement takes place at the default movement speed for the tilt, this being

available to change through the Set Move Speeds option of the Joystick.

Auto Level. This button opens the dialog that starts the controls the auto level function of the traverse unit . The dialog allows the setting of values for the levelling operation, the position of the initial cresting position, the data length to be used,the run up length to be used and the measurement speed to be used. There are also flags that allow the user to specify contact before measure, move z (ie traverse unit) and tilt after measure, and auto move z (ie traverse unit) away from surface.

Device Control Dialog for Rotary Stage



Selected by:

- Clicking on **Form Talysurf>Control>Rotary Stage**.
  NB The option will be 'ticked' if the dialog is already open.

Or

- Right mouse clicking on the Rotary Stage icon and selecting Control.

Or

- Clicking on **Form Talysurf>Instrument Status**, double clicking on the Rotary Stage icon.

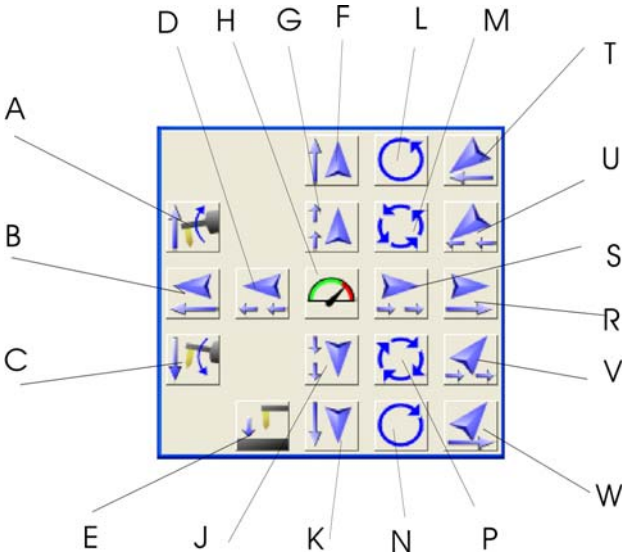
The buttons on this dialog are:

Move Relative Rotary Stage (Anti-Clockwise). The button opens the dialog which moves the rotary stage in the requested direction by a relative amount. The Movement has its own dialog and the field on it is Rotary Distance and the value is in degrees. Movement takes place at the default movement speed for the rotary stage, this being available to change through the Set Move Speeds option of the Joystick.

Move Relative Rotary Stage (Clockwise). The button opens the dialog which moves the rotary stage in the requested direction by a relative amount. The Movement has its own dialog and the field on it is Rotary Distance and the value is in degrees. Movement takes place at the default movement speed for the rotary stage, this being available to change through the Set Move Speeds option of the Joystick.

Move Absolute Rotary Stage. This button opens the dialog which moves the rotary stage to an absolute angle which you specify, regardless of where it is at present. A positive angle is always anti-clockwise from the horizontal and a negative angle is always clockwise. The absolute movement will be with reference to the current co-ordinate system. Movement takes place at the default movement speed for the rotary stage, this being available to change through the Set Move Speeds option of the Joystick.

On-Screen Joystick



Selected by:

Clicking on **Form Talysurf>Control>Joystick**.
NB The option will be 'ticked' if the dialog is already open.

CAUTION

1. Take extreme care if you are moving the stylus away from the component and there is any obstruction to the movement (for example, if the stylus is inside a hole or tube). If the stylus meets any obstruction under these conditions it will snap off because there is no automatic protection mechanism for a stylus which is moving away from the component. This is a destructive snap off and may also damage the gauge.

2. If, when you switch the system on, the stylus has been left in contact with the component, you must raise the stylus clear of the

surface before using Move Contact. Failure to do this may cause damage to the instrument.

A - Move Continuous Tilt Up. Selecting this button tilts the Z axis in the positive (anticlockwise) direction until the button is released. Movement takes place at the default movement speed for the tilt, this being available to change through the Set Move Speeds option of the Joystick. To stop the movement before it reaches its destination, press the Stop button.

B - Move Continuous X (Negative). Selecting this button moves the X axis in the negative direction until the button is released. Movement takes place at the default movement speed for the traverse unit, this being available to change through the Set Move Speeds option of the Joystick. To stop the movement before it reaches its destination, press the Stop button.

C - Move Continuous Tilt Down. Selecting this button tilts the Z axis in the negative (clockwise) direction until the button is released. Movement takes place at the default movement speed for the tilt, this being available to change through the Set Move Speeds option of the Joystick. To stop the movement before it reaches its destination, press the Stop button.

D - Nudge X (Negative). Selecting this button causes the smallest permissible negative direction move in the X axis.

E - Contact Z. This function controls movement in the Z axis and is called up from the device control dialog for the column. When you press this button the stylus moves into contact with the component at a pre-defined contact speed. The direction in which the contact move is made will be dependent on the selected stylus orientation. There is no control dialog for this function. To stop the movement before it reaches its destination, press the Stop button.

F - Move Continuous Z (Positive). Selecting this button moves the Z axis in the positive direction until the button is released. Movement takes place at the default movement speed

for the column, this being available to change through the Set Move Speeds option of the Joystick. To stop the movement before it reaches its destination, press the Stop button.

G - Nudge Z (Positive). Selecting this button causes the smallest permissible negative direction move in the Z axis.

H - Set Move Speeds. Selecting this will present a dialog that allows the speed for each of the axes to be set and this is the speed that will be used for the continuous movement functions.

J - Nudge Z (Negative). Selecting this button causes the smallest permissible negative direction move in the Z axis.

K - Move Continuous Z (Negative). Selecting this button moves the Z axis in the negative direction until the button is released. Movement takes place at the default movement speed for the column, this being available to change through the Set Move Speeds option of the Joystick. To stop the movement before it reaches its destination, press the Stop button.

L - Move Continuous Rotary Stage (Anti-Clockwise). The button moves the rotary stage in the requested direction at a constant speed. Movement takes place at the default movement speed for the rotary stage, this being available to change through the Set Move Speeds option of the Joystick.

M - Nudge Rotary Stage (Anti-Clockwise). The button moves the rotary stage in the requested direction for the smallest permissable distance.

N - Move Continuous Rotary Stage (Clockwise). The button moves the rotary stage in the requested direction at a constant speed. Movement takes place at the default movement speed for the rotary stage, this being available to change through the Set Move Speeds option of the Joystick.

P - Nudge Rotary Stage (Clockwise). The button moves the rotary stage in the requested direction for the smallest permissable distance.

R - Move Continuous X Positive. Selecting this button moves the X axis in the positive direction until the button is released. Movement takes place at the default movement speed for the traverse unit, this being available to change through the Set Move Speeds option of the Joystick. To stop the movement before it reaches its destination, press the Stop button.

S - Nudge - X Positive. Selecting this button causes the smallest permissible positive direction move in the Z axis.

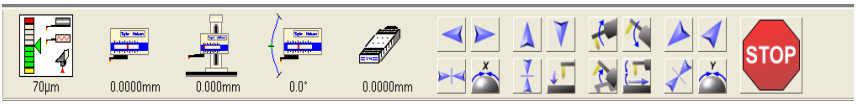
T - Move - Continuous Y Positive. Selecting this button moves the Y axis in the positive direction until the button is released. Movement takes place at the default movement speed for the rotary stage, this being available to change through the Set Move Speeds option of the Joystick.

U - Nudge - Y Positive. Selecting this button causes the smallest permissible positive direction move in the Y axis.

V - Nudge - Y Negative. Selecting this button causes the smallest permissible negative direction move in the Y axis.

W - Move - Continuous Y Negative. Selecting this button moves the Y axis in the negative direction until the button is released. Movement takes place at the default movement speed for the rotary stage, this being available to change through the Set Move Speeds option of the Joystick.

Instrument Toolbar (Instrument Status)



Selected by:

- Clicking on **Form Talysurf>Instrument Toolbar**.

Note. This presents a toolbar, docked above the status bar, containing the instrument status icons and the most commonly used controls of the instrument.

The toolbar contains all of the device move dialogs except for the Rotary Stage. It also contains the main device icons, ie Gauge, Traverse Unit, Column, Tilt and Y Stage.

Note. If the option is not included then the device icon will not be present, ie if there is no YStage then those icons will not be on the toolbar. The Rotary Stage is not shown on the Instrument Toolbar even if it is fitted, due to space limitations.

Immediately below each icon is a numeric read-out of the position of that device.

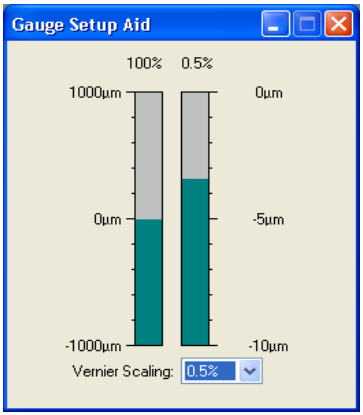
The gauge icon also provides information on the attitude of the gauge, the direction of travel in both the horizontal and vertical and whether or not the gauge is underrange or overrange.

Right Mouse Clicking on any of the numbers below the icons on the Instrument Status View displays a drop down menu containing a number of options.

Right mouse clicking on an icon displays a drop down menu, each of these drop down menus are different. Unlike the drop down menu obtained when right mouse clicking on any of the numbers below the icons.

As an alternative there is an Instrument Status dialog that displays the device icons only, including the Rotary Stage (if fitted). The Instrument Status bar is a floating dialog that is selected by clicking **(New) Form Talysurf>Instrument Status**.

Gauge Set-up aid



The Gauge Setup aid shows the gauge displacement in two Vernier style bar graphs. The left hand graph shows the full range of the gauge as currently selected. The right hand graph shows a percentage of the gauge range, as selected by the Vernier Scaling list box. This allows the sensitivity of the Vernier scale to be adjusted to meet your current requirements.

Selected by:

Right mouse click on the gauge icon and select Setup.

OR

Click on **Form Talysurf>Control>Gauge Setup Aid**.

The centre point on the left-hand scale is the gauge null position. The scale above and below this point is derived from which gauge is fitted, the stylus and the magnification. The right hand scale is a vernier scale related to the left-hand one in that it displays the least

significant digits on a scale that can be selected on the dialog. The scale is expressed in terms of its percentage of the scale on the left.

To change the scale, click in the drop down box to reveal the pre-defined scales available and choose one of them. The percentages are 10%, 5%, 2%, 1% and 0.5%.

Stop Control

Selected by;

- Clicking on **Form Talysurf>Control>Stop Control**.

NB the option will be 'ticked' if the dialog is already open.

This dialog is used in emergency to stop the movement of the traverse unit, column and tilt.

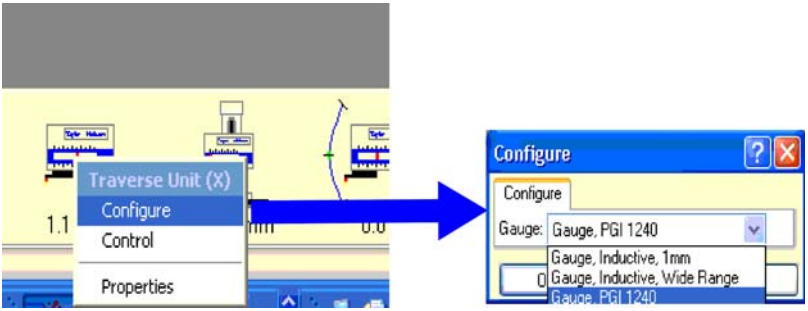
Note. It will not stop the Rotary Stage or the Y Stage.

Operating Ultra Surface Finish

After configuring the software as detailed in Chapter 6, the instrument is now ready for more specific setting up and subsequent use.

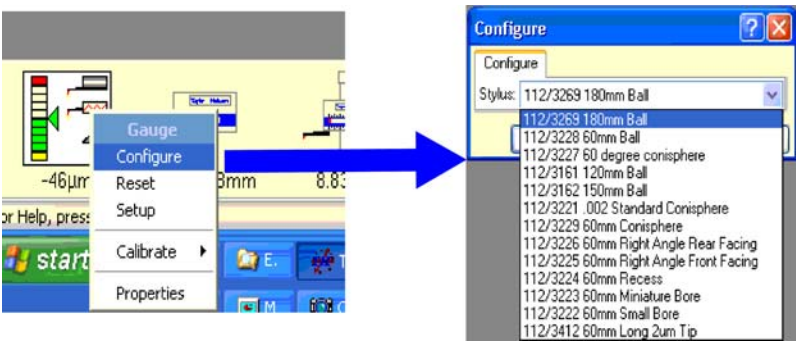
Selecting the Gauge

- Right Mouse click on the Traverse Unit icon and select Configure. Select the required gauge and click OK.



Selecting the Stylus

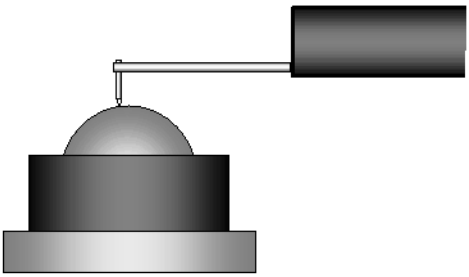
- Right Mouse click on the Gauge icon and select Configure. Select the required stylus and click OK.



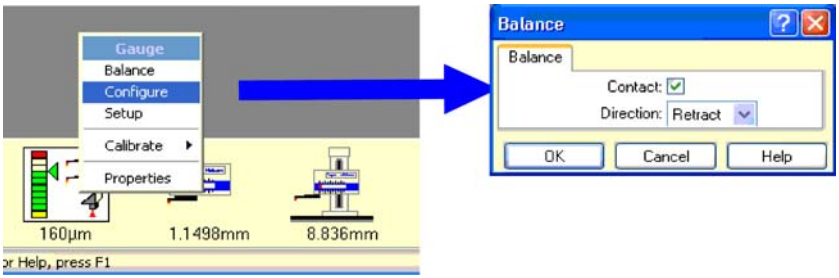
PGI Gauge Reset. If PGI gauge fitted and gauge reading is in error due to sudden move or stylus change /removal, move the gauge away from the component manually and Right Mouse Click on Gauge icon and click Reset.

Caution: Stylus MUST be hanging in free space away from the component or instrument when selecting Reset

Inductive Balance. Position stylus slightly left of crest of ball in X-axis.



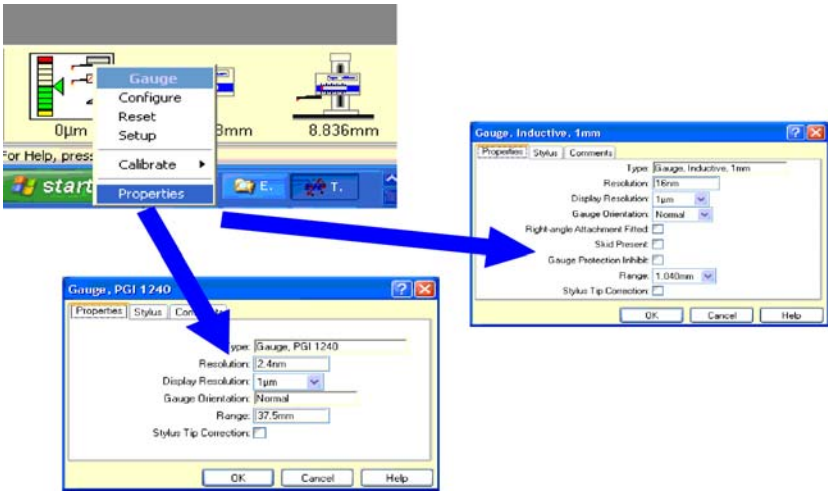
Right Mouse Click on Gauge icon and click balance. Complete dialog and click OK.



Note: Use after changing gauges and prior to a calibration.

Changing gauge Properties

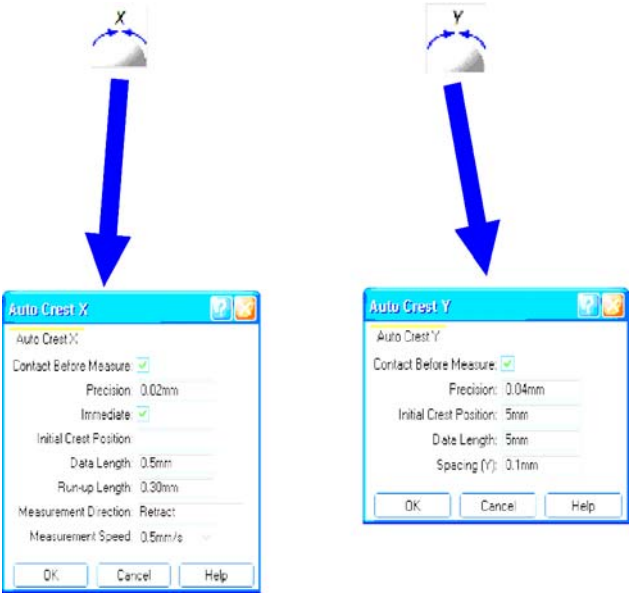
Right Mouse Click on Gauge Icon, select Properties and select Gauge Properties as required. Click OK.



Note: The inductive and wide range gauges require calibration of ranges 1,2 and 3.

Auto Crest

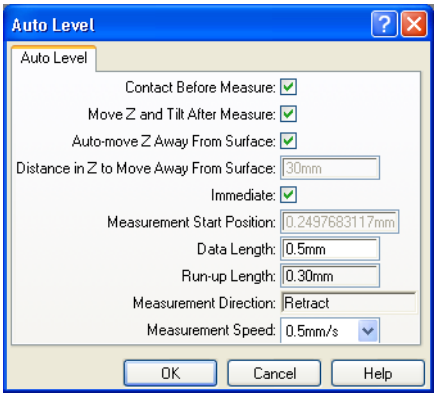
- Click on Auto Crest X / Y Icon (as applicable) and complete dialogue, click OK.



Note: Auto Crest can be used to crest on a feature or fixture prior to setting a UCS Value

Auto Level

- Click on Auto Level Icon.

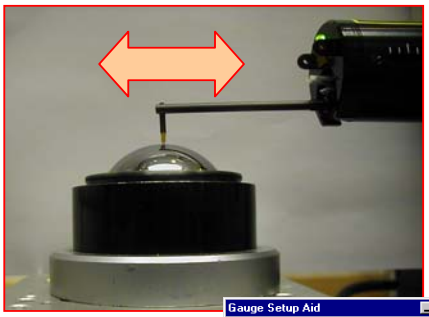


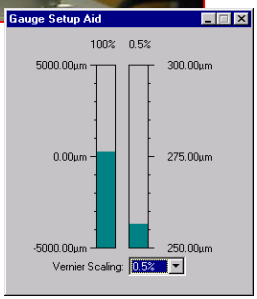
- Complete dialogue to set Traverse Unit Datum parallel to surface and click OK.

Gauge/Stylus Calibration - Motorised Column

Ball Standard.

- Position stylus above Crown of Ball





- Crest by eye in X axis
- Contact the gauge with the ball
- Manually crest Y axis using Gauge Set Up Aid

Note: If your Instrument is fitted with a Motorised Y Stage, you can use Auto Crest Y

- Right Mouse Click on Gauge Icon. Select Calibrate>New
- Select the required standard and click OK
- Right Mouse Click on Check Relevant Boxes. Enter Gauge Range Value and click OK

- Check Pt Value and Z1 Value

PGI System

Table 1:

Stylus Code	112/2619	112/2620
Stylus Type	Standard (60mm)	0.5mm Ball (120mm)
Calibration Radius	80mm	80mm
Form Error (Pt)	<0.25µm	<1.30µm
Calibrated Range	±4mm	±8mm

PGI System Calibrated for Maximum Accuracy Over 40% Gauge Range

Stylus Code	112/2619	112/2620
Stylus Type	Standard (60mm)	0.5mm Ball (120mm)
Calibration Radius	22mm	22mm
Form Error (Pt)	<0.15µm	<0.35µm
Calibrated Range	±2mm	±4mm

Standard Inductive Gauge

Stylus Code	112/2009	112/2010
Stylus Type	Standard (60mm)	0.5mm Ball (120mm)
Calibration Radius	12.5mm	22mm
Form Error (Pt)	<0.25µm	<0.50µm

Three line Standard.

Note. When the gauge is calibrated using the three line standard it should only be used for surface finish measurement within the centre of the gauge range.

- Use Auto Level, see page 5-27, to set the Traverse Unit datum parallel to the glass surface
- Right Mouse Click on Gauge icon, select Calibrate>New.
- Type in the New Standard name and Select the required Standard and click OK
- Type in Line (Step) height and click OK
- Position Stylus in 3 Line Standard Calibration Rectangle.
- Select relevant check boxes
- Check Measurement start position is correct and click OK.
- Check Z1 Value equals approximately 1.

Gauge/Stylus Calibration - Manual Column/ Free Standing

Calibrating using the Ball Standard.

Gauge Calibration should be performed on each gauge range to be used. This is carried out as follows:

Before the calibration measurement is made, the Ball standard must be placed below the stylus tip and crested, to the best accurately possible, in both the X and Y-axes.

Y-axis cresting:

- Using the Adjustable Height Unit on the Traverse Unit or the height adjustment on the column, **carefully** bring the stylus into contact with the ball.
- Manually crest the gauge in the Y-axis by carefully moving the standard using the Gauge Set up aid until a peak reading is obtained.

X-axis Cresting:

- Having determined the crown position in the Y-axis and ensured that the stylus is within a few mm of the crown position in the x-axis, click on Auto Crest X on the Instrument Toolbar. Complete the dialog and click GO
- Right Mouse Click on the Gauge icon and select Balance, click OK. The Gauge is now balanced.

Calibrating:

- Right Mouse Click on Gauge Icon. Select Calibrate>New
- Select the required standard and click OK

- Enter Gauge Range Value and click OK

Assessing Calibration Results

Generally, the calibration measurement is acceptable when the measured form error, excluding spurious peaks or valleys, does not exceed the value given below, for the stylus type used.

Note. References in the following table are for the Inductive Gauge only.

Stylus Code	112/ 2009	112/ 2010	112/ 2011	112/ 2012	112/ 2013
Stylus Type	Standard (60mm)	0.5mm Ball (120mm)	2mm recess	2mm Small bore	Chisel edge
Calibration Radius	12.5mm	22mm	12.5mm	12.5mm	12.5mm
Form Error (Pt)	<0.25µm	<0.50µm	<0.25mm	<0.25mm	<0.3mm

Calibrating using the 3-Line Standard.

Gauge Calibration should be performed on each gauge range to be used. Calibrate using the 2.5µm (nominal) height lines on the 3-line standard.

- Position the standard below the sytylus.

Note. Before performing the calibration procedure, a check measurement should be made to ensure that:
a) the calibration traverse can be completed without the gauge going out of range,
b) all three lines are contained in the traverse,

c)the 3-line standard is nominally level (ie parallel to the traverse datum) and,
d)the line standard is in good condition (ie no scratches or dirt).

The calibration is carried out as follows:

- Lower the stylus into contact with the standard at a point just in front of the marked rectangle which contains the three lines to be measured. The stylus should be positioned to bring the gauge reading to approximately its mid-position i.e. a reading of about zero.
- Check that the calibration standard is nominally level with respect to the traverse unit. This can be done initially by eye and then by observing the gauge height position at the two ends of the proposed traverse (which is typically 4mm long). :
- Right Mouse Click on Gauge icon, select Calibrate>New.
- Type in the New Standard name and Select the required Standard and click OK
- Type in Line (Step) height and click OK
- Select relevant check boxes
- Check Measurement start position is correct and click OK.
- Check Z1 Value equals approximately 1.

Measurement Options

Setting Measurement Options and making a measurement

- Contact onto Measurement Area by clicking on the Contact button

- Click on GO to set Measurement Options

OR

- Click on Measure & Analyse>Measure

Then in both cases:

- Complete Measure Dialog Box and click OK

Measure dialogs

The Measure Dialog contains the settings for a requested measurement. When you select ‘OK’ or as soon as you press ‘Enter’ in any field the instrument carries out a Data Collection with the settings as displayed.

When the measure is complete the resulting raw profile is displayed in the Data Selection View

To move from one field to the next, use the mouse pointer or the tab key. Many of the fields on this dialog are related to the co-ordinate system which is in use at the time. The field entitled

Move X Back to Start Position is what was formerly called Auto lift-off. The fields are:

Auto-name. With the Auto-name box checked, the analysis is named as the next one in the sequence.

Measurement Name. With the Auto-name box checked, the Measurement Name is automatically created, when it is unchecked the Measurement can be given a specific name.

Immediate. When this is checked the instrument will start from its current position and after moving the run-up length, start collecting data. If this field is not checked the instrument will collect data starting at the absolute position specified in the 'Measurement Start Position' field

Measurement Start Position. This is the absolute position on the traverse where you want the measurement to start. This field is used only if the 'Immediate' field is not checked. You may enter units as well as value in this field.

Data Length . Specifies the length of the measurement data that is to be analyzed. The analysis will begin from the 'Selected Area' start position if one has been set. It is independent of start position. You may enter units as well as value in this field.

Run Up Length . This is the amount by which the traverse unit moves prior to collecting data. Applies to both 'Immediate' and 'Measurement Start Position' fields. Will go back beyond the start position (if Immediate is not checked) specified in 'Measurement Start Position' field. You are strongly advised to keep to 0.3mm. You may enter units as well as value in this field. When you change this value from the default value, the system remembers the new value

Measurement Direction. This is the direction in which the Traverse unit will move when a measurement is being made.

Measurement Speed. The options are 0.5mm/sec and 1.0mm/sec. Generally if the measurement length is less than 30mm you

should use a 0.5mm/sec traverse speed. The EIM will provide a data density of one data point every quarter-micron if the measurement length is less than 30mm. If the measurement length is 30mm or greater, the data density is one data point per micron. When you change this value from the default value, the system remembers the new value

Move Z Before Contact. This refers to the rapid movement of the column carriage downwards prior to the final move into contact with the component. You would normally use this if you are also using the Move Z after Measure.

Move Z Before Contact to. Enabled when the Move Z before contact field is selected. You may enter units as well as value in this field.

Contact Before Measure . When checked, this will drive the column carriage automatically so that the gauge is in its centre position. Uncheck this box to move the gauge into contact manually.

Move Z After Measure . This moves the column carriage away from the component after data collection (by the specified distance). You may enter units as well as value in this field. This feature can be used in conjunction with "Move X Back to Start Position", to position the Treverse unit ready for a new measurement.

Move X Back to Start Position . This moves the traverse unit back to the start position (allowing for any run up length) ready for a new data collection pass.

Display Measurement. When this box is checked the measurement results are automatically displayed after the measurement. If the box is unchecked the results will not be shown. Used on all measurement dialogs.

Viewing a Raw Profile

View the Raw Profile displayed in the Data Selection View that appears automatically after taking a measurement.

The Data Selection View shows the raw profile and also comprises three columns:

- Current Point. The first column is the X and Z co-ordinates of the crosshair cursor position.
- Reference Point. The second column is the co-ordinates of the Reference Point (expressed as offsets from the current co-ordinate system).
- Difference. The third column is the difference between the Current Point and the Reference Point cursors.

The value labelled Pitch in the Difference column is the “straight line” (or Euclidean) distance between the two points.

The Zoom Context Panel in the bottom right hand corner of the view shows a small copy of the entire profile at all times and also the current state of the zoom.

Data selection view supports several facilities for navigating the view. These are:

- Zooming
- Moving the zoomed area
- The Cursor and Reference
- Cursor movement
- Moving the selection boundaries
- Auto Scaling and Associated Excluding

- Excluding Parts of the Profile from the Form-Fit

Analysis Options

Setting Analysis Options

- Click on the “New Analysis” Icon
- Or alternatively Right Mouse Click on Profile and then select New>Analysis
- Select Auto Name or Type in an Analysis Name
- Select Analysis Type and click OK
- Select Form Tab and then select the required Form Fit
- Select Filter & Data Tab and then select the required filter, data length options, the cut-off values and the bandwidth.
- Select Parameters Tab and select the Required Parameters and click OK

Analysis Dialog

Click the Analyse button on the Data Selection toolbar () and this calls up the Analysis Selection dialog.

Auto-name. With the Auto-name box checked, the analysis is named as the next one in the sequence.

Analysis Name. With the Auto-name box unchecked, the analysis can be given a specific name

Analysis Type. Select the required analysis from the drop down box (e.g. Primary, Roughness or Waviness .etc.)

Display Analysis. With the Display Analysis box checked the analysis is automatically displayed, with it unchecked the analysis is carried out in the background.

View Analysis

- View the analysis results and check against the required results.

Printing

- Click on Print Icon

OR

- Select File>Print>Configure Printer and select OK

OR

- Right Mouse Click On Profile, select Print>Default / Roughness / Tolerances Or Layout

OR

- Select View>Folders and Right Mouse Click On File, select Print>Default / Roughness / Tolerances Or Layout

Viewing & Re-Analysis

View an Old Measurement

- Click on View>Folders

OR

- Click on File>Open

Then in all cases:

- Open (+) Folder and the Right Mouse Click on Raw Data File and click Display>Default (Layout)

OR alternatively

- Click on File Open icon ,select file and click OK

Analyse an Old Measurement

- Right Mouse Click on the Graph and click New>Analysis

OR

- Right Mouse Click on the file to be analysed and click New>Analysis

Chapter 9
Roundness Maintenance Instructions

Talyrond 73 Maintenance

The following is a list of the performance checks that can be carried out on the complete system. The checks, or any group of them, should be carried out in the sequence indicated.

On Installation

1 Pick-up resistive balance

2 Pick-up phase balance

3 Pick-up sensitivity

4 Electrical stability

5 Radial accuracy of spindle

6 Shoulder attachment magnification

7 Squareness of worktable

Periodic maintenance

Daily Oil the spindle (start of day).

Weekly Check pick-up sensitivity.

- If it has changed by less than 5%, adjust.
- If it has changed by more than 5% and is tending to progressively increase or decrease, carry out checks 1 to 7 in sequence.

- Clean the worktable.

Monthly Clean the worktable slideway with a proprietary solvent and cover with a thin film of Alanzol Kalubleum grease.

Care of the Glass Standard

Reasonable care must be taken of the glass standard. It should be cleaned only with a soft lint-free cloth. If necessary the cloth may be moistened with a suitable non-abrasive cleaner such as Ethanol. Local rubbing to remove a patch of dirt must be avoided; wiping action should be round and round, and heavy rubbing should be avoided altogether.

When the standard is not in use always keep the cover on, and store in the appropriate position in the accessories drawer in the desk.

IMPORTANT. Do not disturb the screws of the retaining clips as this could distort the standard. DO not remove the standard or rotate it in its mount. It has been calibrated with reference to the red dot, it is therefore important that the rotational position of the standard with respect to the dot is retained.

Care of an Idle Instrument

If the instrument is to be left idle for a length of time, the following steps should be taken to prevent deterioration.

Clean all bright parts and apply a thin film of Alanzol Kalubleum grease. If the relative humidity is high, cover the worktable with anti-corrosion grease or V.P.I. paper.

The spindle should be removed from the basic instrument, packed in an airtight envelope with a desiccant and stored in its transit box. The method of doing this is the reverse of the instructions

given in the Unpacking and Erection Instructions. It entails removal of the pick-up and slide rail and then the spindle.

The spindle locating pads and arms and all uncovered bright parts should then be cleaned and given a light coating of Alanzol Kalubleum grease.

Maintenance of the Spindle

Lubrication.

Notes:

i The spindle should be lubricated daily.

ii Always use the specially prepared spindle oil (Taylor Hobson Part No. B112/2562) supplied in sealed cartridges and always inject using the syringe provided.

iii Oil from the overflow must not be re-used for lubricating the spindle

Lubricating the spindle.

1. Select a needle and assemble it with a spindle oil cartridge and a plunger. Depress the plunger until a few drops of oil are ejected from the needle end.

WARNING.

ENSURE THAT THE POWER TO THE INSTRUMENT IS SWITCHED OFF.

2. Rotate the spindle to bring the stylus to the 6 o'clock position. Open the access door on the front of the spindle. Make sure the area around the oil hole is clean and free from dust, then open the cover.

3. Insert the syringe needle and depress the plunger until, after a short delay, oil is seen to issue from the overflow spout into the cup at the foot of the spindle. The cup is held in place by a spring clip and can be removed for emptying.

4. Close the oil hole cover and the access door. Stow the syringe in the tube provided in the fret in the accessory drawer.

Checks and Adjustments

In these checks it is assumed that the operator is familiar with the normal operating procedure.

If the requirements specified in the following checks cannot be met by means of the adjustments described, the fault should be referred to a Taylor Hobson service engineer.

Setting the gauge Phase and Resistive Balance on the TR73.

See Setting Resistive and Phase Balance (Talyrond 73 only) on page 5-23.

Calibration and Gain checks.

300µm Flick Standard

1. Select the appropriate 63.5mm stylus arm in Ultra. Set up the calibrated master 300µm flick standard and the 63.5mm stylus. Centre the standard using the Centring and Leveling aid.

2. Select - New Calibration, enter an appropriate name.

3. Enter Flat Depth (as on Flick standard).

4. Select range 1.27mm. Then perform the calibration as directed by Ultra.

20µm Flick Standard

1. Select the appropriate 63.5mm stylus arm in ULTRA. Set up the calibrated master 20µm flick standard and the 63.5mm stylus. Centre the standard using the Centring and Leveling aid.

2. Select - New Calibration, enter an appropriate name.

3. Enter Flick depth (as on Flick standard)

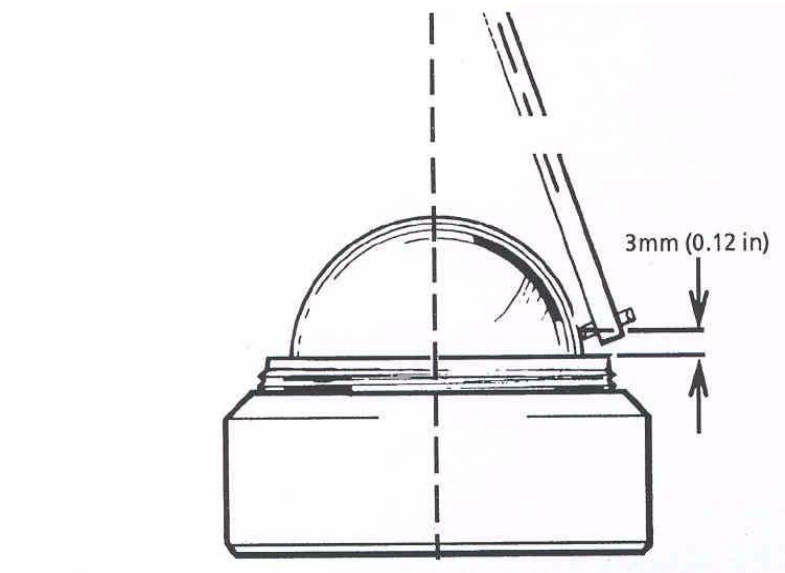
4. Select range 0.254mm. Then perform the calibration as directed by Ultra.

To calibrate the 127mm and 254mm stylus arms, use the 300µm Flick standard and follow the procedure above after first selecting the appropriate stylus arm in Ultra.

Radial Accuracy of the Spindle (use a 63.5mm stylus arm).

1. Place the glass standard centrally on the worktable with the red dot on the mount in line with the table Y axis adjustment knob.

2. Adjust the height of the worktable and radial position of the pick-up to bring the stylus into contact with, and normal to, the surface of the standard 3mm (0.12 in) above the metal mount.



3. Centre as for a roundness measurement using the 1.27mm gauge range.

4. Select the 0.254mm gauge range and re-centre.

5. Make a measurement of the glass standard.

6. Examine the displayed results. The radial error should not exceed that quoted in the Specifications.

7. Irregularities in the profile could result from:

    - Temperature effects, including the effects of handling the standard and draughts around the standard.

- Damage to the spindle.
- Imperfections (such as dirt, scratches or wear) on the standard.

8. Eliminate the first of these and then check the other two as follows.

9. Move the stylus away from glass standard and turn the standard to bring the red dot to the 3 o'clock position.

10. Repeat steps 3, 4 and 5 and compare the two profiles with each other and with the NAMAS certificate if one is provided with the standard.

11. a) If the imperfections have moved round with the standard, the standard is at fault.

Caution
Do not increase the pressure of the clips retaining the standard as this could cause distortion of the glass.

b) If the imperfections in both profiles occur in the same place relative to the Talyrond spindle the fault possibly lies in the spindle. Notify a Taylor Hobson service engineer.

It is essential to carry out tests with the standard in more than one orientation to obviate the possibility of a perfect trace resulting from error in the standard exactly cancelling spindle error, and the tests described above are the minimum that will meet this requirement.

Talyrond 4 Maintenance

The following is a list of the performance checks that can be carried out on the complete system. The checks should be carried out in the sequence indicated.

On Installation

- Resistive and Phase balance test, see page 5-9 of this section.
- Gauge Calibration, see Operating/On Line Help Instructions.
- Radial accuracy of spindle, see page 5-11of this section.

Periodic Maintenance

WARNING.

A PAIR OF WEIGHTS ARE ATTACHED BY CABLES TO THE INSTRUMENT CARRIAGE TO COUNTERBALANCE THE WEIGHT OF THE CARRIAGE. THERE IS A SAFETY MECHANISM THAT OPERATES TO PREVENT THE CARRIAGE MOVING IN THE EVENT THAT A CABLE SHOULD BREAK. HOWEVER IT IS VITALLY IMPORTANT THAT THESE CABLES ARE REPLACED ON A YEARLY BASIS TO MAINTAIN THE SAFETY INTEGRITY OF THE SYSTEM. THIS TASK SHOULD ONLY BE ATTEMPTED BY SUITABLY QUALIFIED ENGINEERS, PREFERABLY TAYLOR HOBSON SERVICE ENGINEERS.

Daily. Oil the spindle at the start of each day, see MAINTENANCE OF THE SPINDLE on page 5-10.

Weekly. Check Gauge Calibration, see the On Line Help Instructions. If it has changed by less than 5%, adjust. If it has changed

by more than 5% and is tending to progressively increase or decrease, carry out checks 1 to 7 in sequence.

After first six months. The Oil Filter on the VSM needs replacing after the first six months of use. After then it should only be replaced when the oil pressure is approaching minimum, see procedure on page 5-13.

When a new gauge is fitted. Run the Resistive and Phase balance test, see RESISTIVE AND PHASE BALANCE TEST on page 5-9, followed by the Gauge Calibration, see On Line Help Instructions.

Resistive and Phase Balance Test

During final inspection of the Talyrond 4, the resistive and phase balance of the system electronics are set to suit the gauge supplied with the instrument. Further adjustment should not be necessary unless the gauge is changed or altered in some way.

To reset the resistive and phase balance carry out the procedure detailed in the On Line Help Instructions:

Care of the Glass Standard

See procedure on page 5-2.

Care of an idle instrument

If the instrument is to be left idle for a length of time, it is advisable that certain steps are taken to protect the spindle. If the instrument is required to be left idle for any duration, please contact Taylor Hobson Service Department for advice.

Maintenance of the Spindle

Lubrication.

Notes:

i The spindle should be lubricated daily.

i Always use the specially prepared spindle oil C supplied in sealed cartridges and always inject using the syringe provided.

iii Oil from the overflow must not be re-used for lubricating the spindle.

Select a needle and assemble it with a spindle oil cartridge and a plunger. Depress the plunger until a few drops of oil are ejected from the needle end

WARNING

ENSURE THAT THE POWER TO THE INSTRUMENT IS SWITCHED OFF.

Rotate the spindle to bring the stylus to the 5 o'clock position. Remove the two screws from the top of the motor cover and lift off the cover. Make sure the area around the oil hole is clean and free from dust.

Insert the syringe needle and depress the plunger until, after a short delay, oil is seen to issue from the overflow spout into the cup at the foot of the spindle. The cup is held in place by a spring clip and can be removed for emptying.

Replace the motor cover and screw it in position, Stow the syringe in the tube provided in the fret in the accessory drawer.

Checking the Radial Accuracy of the Spindle

If the requirements specified in the following check cannot be met, the fault should be referred to a TH service engineer.

- Place the glass standard centrally on the worktable with the red dot on the mount in line with the table Y axis adjustment.
- Adjust the height and radial position of the pick-up to bring the stylus into contact with, and normal to, the surface of the standard 3mm (0.12 in) above the metal mount.3mm (0.12 in)

Centre as for a roundness measurement. This should be done as accurately as possible with an eccentricity not exceeding 10 times the expected P to V value.

Make a measurement of the glass standard, evaluate to LS reference circle with 1-50 upr 2CR filter, 2000 ordinates 0 points deleted.

Examine the displayed results. After making an allowance for any errors in the hemisphere, the radial error should not exceed that quoted in the Specifications. Hemisphere errors (which are quantified on the NAMAS calibration certificate - if provided) can be estimated as described in the folowing steps.

Irregularities in the profile could result from:

- Temperature effects, including the effects of handling the standard and draughts around the standard.
- Damage to the spindle.
- Imperfections (such as dirt, scratches or wear) on the standard.

Eliminate the first of these and then check the other two as follows.

Move the stylus away from glass standard and turn the standard to bring the red dot to the 3 o'clock position.

Repeat the process and compare the two profiles with each other and with the Namas certificate if one is provided with the standard.

- If the imperfections have moved round with the standard, the standard is at fault.

Caution

Do not increase the pressure of the clips retaining the standard as this could cause distortion of the glass.

- If the imperfections in both profiles occur in the same place relative to the Talyrond spindle the fault possibly lies in the spindle. Notify a TH service engineer.

It is essential to carry out tests with the standard in more than one orientation to obviate the possibility of a perfect trace resulting from error in the standard exactly cancelling spindle error, and the tests described above are the minimum that will meet this requirement.

It is recommended that occasional checks should be carried out in which the standard is turned through a series of small angles (30^{o}) and the profile graphs compared. In this way the possibility of any radial error in the spindle being masked by exactly opposed ellipticity in the standard can be eliminated.

Replacement of VSM oil filter.

Note.

It is recommended that the filter is replaced after the first six months of use, and thereafter only as necessary when the oil pressure is approaching minimum.

Precautions. When carrying out a filter change it must be realised that scrupulous cleanliness is essential; in the bearing the oil flows through minute orifices (restrictors) which could easily be blocked by very small particles. If this happens there is a danger that the restrictor would have to be replaced, a servicing operation which must be avoided if at all possible. The hydraulic components form part of a recirculating system in which the filter collect any particles circulating in the oil before they reach the bearing. However, when the filter is changed, this system has to be opened and special precautions must be taken to prevent dirt entering the pipe between the filter and the bearing. The following precautions should be taken:

- If possible, filter replacement should be carried out in a clean, dust-free environment.
- Before opening the system, clean the external surfaces in the vicinity of the Filter Housing.
- None of the oil that is collected during a filter change must be allowed to return to the system. The amount of oil lost during filter replacement is negligible in comparison with the amount in the system (approx. 18 litres), and the reservoir need not be topped up.
- Two replacement filters and four replacement seals are supplied as a kit (code 112/1364). They have been ultrasonically cleaned and are dispatched in a sealed plastic bag which should not be opened until the contents are required for use.
- Although a suitable shallow tray can be used to catch oil from the VSM housing (VSM), it is difficult to catch all the oil that

drains from the pipe or the Filter Housing. Have some absorbent tissue or clean cloth ready, but be careful not to allow any lint or paper particles to enter the oil system.

- All exposed wires are at low voltage.

Replacement Procedure.

Switch off the pump and allow a little time for the oil to drain back into the reservoir.

For access to the VSM Filter Housing, remove the LH side panel only.

Referring to the picture below and providing a container ready to catch the oil that will escape, remove the four screws and carefully withdraw the end cap from the Filter Housing.

Note.

About 0.2 litre (1/3 pint) of oil can be expected to drain from the box.

Withdraw the filter element from the Filter Housing, being careful not to dislodge any dirt particles from the surface.

Remove the rectangular sealing ring from the bottom of the filter housing. With a lint free tissue thoroughly wipe the inside of the Filter Housing and the outside end face.

Open the bag containing the replacement filter and place one of the seals at the far end of the Filter Housing.

Remove and discard the seal from the end cap. Clean the end cap and fit a new seal. Seals are identical. Leave the 'O' ring in place, there is normally no need to renew it.

Place the new filter element in the Filter Housing and refit the end cap, making sure that the filter seats on the seal at either end. Refit and tighten the four screws.

Refit the LH side panel to the VSM.

Talyrond 400 Maintenance

The following is a list of the performance checks that can be carried out on the complete system. The checks should be carried out in the sequence indicated.

On Installation

- Resistive and Phase balance test, see page 5-16 of this section.
- Gauge Calibration, see On Line Help Instructions.
- Radial accuracy of spindle, see page 5-17 of this section.

Periodic Maintenance

WARNING.

A PAIR OF WEIGHTS ARE ATTACHED BY CABLES TO THE INSTRUMENT CARRIAGE TO COUNTERBALANCE THE WEIGHT OF THE CARRIAGE. THERE IS A SAFETY MECHANISM THAT OPERATES TO PREVENT THE CARRIAGE MOVING IN THE EVENT THAT A CABLE SHOULD BREAK. HOWEVER IT IS VITALLY IMPORTANT THAT THESE CABLES ARE REPLACED EVERY TWO-YEARS TO MAINTAIN THE SAFETY INTEGRITY OF THE SYSTEM. THIS TASK SHOULD ONLY BE ATTEMPTED BY SUITABLY QUALIFIED ENGI-

NEERS, PREFERABLY TAYLOR HOBSON SERVICE ENGINEERS.

Weekly. Check Gauge Calibration, see the On Line Help Instructions. If it has changed by less than 5%, adjust. If it has changed by more than 5% and is tending to progressively increase or decrease, carry out the checks in the On-Line Help in sequence.

After first six months. The Oil Filters on the VSM and Spindle need replacing after the first six months of use. After then it should only be replaced when the oil pressure is approaching minimum, see procedure on page 5-19.

When a new gauge is fitted. Run the Resistive and Phase balance test, see RESISTIVE AND PHASE BALANCE TEST on page 5-16, followed by the Gauge Calibration, see Operators/On Line Help Instructions.

Resistive and Phase Balance Test

During final inspection of the Talyrond 400, the resistive and phase balance of the system electronics are set to suit the gauge supplied with the instrument. Further adjustment should not be necessary unless the gauge is changed or altered in some way.

To reset the resistive and phase balance carry out the procedure detailed in the On Line Help Instructions:

Care of the Glass Standard

See procedure on page 5-2.

Care of an idle instrument

If the instrument is to be left idle for a length of time depending on the environment, it is advisable that certain steps are taken to pro-

tect the spindle. If the instrument is required to be left idle for any duration, please contact Taylor Hobson Service Department for advice.

Checking the Radial Accuracy of the Spindle

If the requirements specified in the following check cannot be met, the fault should be referred to a TH service engineer.

Place the glass standard centrally on the worktable.

Adjust the height and radial position of the pick-up to bring the stylus into contact with, and normal to, the surface of the standard 3mm (0.12 in) above the metal mount.3mm (0.12 in)

Centre as for a roundness measurement. This should be done as accurately as possible with an eccentricity not exceeding 10 times the expected P to V value.

Make a measurement of the glass standard, evaluate to LS reference circle with 1-50 upr 2CR filter, 2000 ordinates 0 points deleted, see On Line Help Instructions.

Examine the displayed results. After making an allowance for any errors in the hemisphere, the radial error should not exceed that quoted in the Specifications. Hemisphere errors (which are quantified on the NAMAS calibration certificate - if provided) can be estimated as described in the following steps.

Irregularities in the profile could result from:

- Temperature effects, including the effects of handling the standard and draughts around the standard.
- Damage to the spindle.
- Imperfections (such as dirt, scratches or wear) on the standard.

Eliminate the first of these and then check the other two as follows.

Move the stylus away from glass standard and turn the standard through 90 degrees.

Repeat the process and compare the two profiles with each other and with the Namas certificate if one is provided with the standard.

If the imperfections have moved round with the standard, the standard is at fault.

Caution

Do not increase the pressure of the clips retaining the standard as this could cause distortion of the glass.

If the imperfections in both profiles occur in the same place relative to the Talyrond spindle the fault possibly lies in the spindle. Notify a TH service engineer.

It is essential to carry out tests with the standard in more than one orientation to obviate the possibility of a perfect trace resulting from error in the standard exactly cancelling spindle error, and the tests described above are the minimum that will meet this requirement.

It is recommended that occasional checks should be carried out in which the standard is turned through a series of small angles (30^{o}) and the profile graphs compared. In this way the possibility of any radial error in the spindle being masked by exactly opposed ellipticity in the standard can be eliminated.

Replacement of VSM oil filter.

Note

It is recommended that the filter is replaced after the first six months of use, and thereafter only as necessary when the oil pressure is approaching minimum.

Precautions. When carrying out a filter change it must be realised that scrupulous cleanliness is essential; in the bearing the oil flows through minute orifices (restrictors) which could easily be blocked by very small particles. If this happens there is a danger that the restrictor would have to be replaced, a servicing operation which must be avoided if at all possible. The hydraulic components form part of a recirculating system in which the filter collect any particles circulating in the oil before they reach the bearing. However, when the filter is changed, this system has to be opened and special precautions must be taken to prevent dirt entering the pipe between the filter and the bearing. The following precautions should be taken:

- If possible, filter replacement should be carried out in a clean, dust-free environment.
- Before opening the system, clean the external surfaces in the vicinity of the Filter Housing.
- None of the oil that is collected during a filter change must be allowed to return to the system. The amount of oil lost during filter replacement is negligible in comparison with the amount in the system (approx. 18 litres), and the reservoir need not be topped up.
- Two replacement filters and four replacement seals are supplied as a kit (code 112/1364). They have been ultrasonically cleaned and are dispatched in a sealed plastic bag which should not be opened until the contents are required for use.
- Although a suitable shallow tray can be used to catch oil from the VSM housing (VSM), it is difficult to catch all the oil that

drains from the pipe or the Filter Housing. Have some absorbent tissue or clean cloth ready, but be careful not to allow any lint or paper particles to enter the oil system.

- All exposed wires are at low voltage.

Replacement Procedure.

Switch off the pump and allow a little time for the oil to drain back into the reservoir.

For access to the VSM Filter Housing, remove the LH side panel only.

Referring to the picture below and providing a container ready to catch the oil that will escape, remove the four screws and carefully withdraw the end cap from the Filter Housing.

Note.

About 0.2 litre (1/3 pint) of oil can be expected to drain from the box.

Withdraw the filter element from the Filter Housing, being careful not to dislodge any dirt particles from the surface.

Remove the rectangular sealing ring from the bottom of the filter housing. With a lint free tissue thoroughly wipe the inside of the Filter Housing and the outside end face.

Open the bag containing the replacement filter and place one of the seals at the far end of the Filter Housing.

Remove and discard the seal from the end cap. Clean the end cap and fit a new seal. Seals are identical. Leave the 'O' ring in place, there is normally no need to renew it.

Place the new filter element in the Filter Housing and refit the end cap, making sure that the filter seats on the seal at either end. Refit and tighten the four screws.

Refit the LH side panel to the VSM.

Replacement of Spindle oil filter.

Note

It is recommended that the filter is replaced after the first six months of use, and thereafter only as necessary when the oil pressure is approaching minimum.

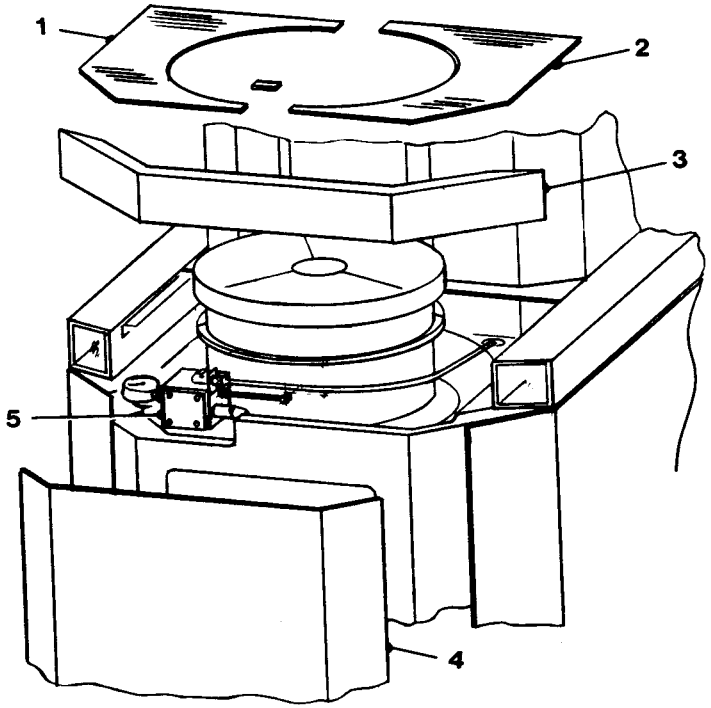
Precautions. When carrying out a filter change it must be realised that scrupulous cleanliness is essential; in the bearing the oil flows through minute orifices (restrictors) which could easily be blocked by very small particles. If this happens there is a danger that the restrictor would have to be replaced, a servicing operation which must be avoided if at all possible. The hydraulic components form part of a recirculating system in which the filter collect any particles circulating in the oil before they reach the bearing. However, when the filter is changed, this system has to be opened and special precautions must be taken to prevent dirt entering the pipe between the filter and the bearing. The following precautions should be taken:

- If possible, filter replacement should be carried out in a clean, dust-free environment.
- Before opening the system, clean the external surfaces in the vicinity of the Filter Housing.

- None of the oil that is collected during a filter change must be allowed to return to the system. The amount of oil lost during filter replacement is negligible in comparison with the amount in the system (approx. 18 litres), and the reservoir need not be topped up.
- Two replacement filters and four replacement seals are supplied as a kit (code 112/1364). They have been ultrasonically cleaned and are dispatched in a sealed plastic bag which should not be opened until the contents are required for use.
- Although a suitable shallow tray can be used to catch oil from the VSM housing (VSM), it is difficult to catch all the oil that drains from the pipe or the Filter Housing. Have some absorbent tissue or clean cloth ready, but be careful not to allow any lint or paper particles to enter the oil system.
- All exposed wires are at low voltage.

Replacement Procedure. Switch off the pump and allow a little time for the oil to drain back into the reservoir.

For access to the Spindle Filter Housing, remove the front panel, the RH and LH cover plates and the base frame front section to expose the Spindle Filter Housing, see figure below.



LH Cover Plate
RH Cover Plate
Base Frame Front Section
Front Panel
Spindle Filter Housing

Providing a container ready to catch the oil that will escape, remove the four screws and carefully withdraw the end cap from the Filter Housing.

Note.

About 0.2 litre (1/3 pint) of oil can be expected to drain from the box.

Withdraw the filter element from the Filter Housing, being careful not to dislodge any dirt particles from the surface.

Remove the rectangular sealing ring from the bottom of the filter housing. With a lint free tissue thoroughly wipe the inside of the Filter Housing and the outside end face.

Open the bag containing the replacement filter and place one of the seals at the far end of the Filter Housing.

Remove and discard the seal from the end cap. Clean the end cap and fit a new seal. Seals are identical. Leave the 'O' ring in place, there is normally no need to renew it.

Place the new filter element in the Filter Housing and refit the end cap, making sure that the filter seats on the seal at either end. Refit and tighten the four screws.

Refit the front panel, the RH and LH cover plates and the base frame front section.

Chapter 10
Surface Maintenance Procedures

PGI Gauge

PGI Warranty label

Caution

- **The PGI Gauge contains no user Servicable Parts. No attempt is to be made to access the gauge in the unlikely event that it fails. In order to access the gauge the above label has to be removed and removal of the label will invalidate the Warranty on the Gauge. Please contact Taylor Hobson in the unlikely event that there is a problem with your PGI gauge.#**

Changing components

Caution

- **Under no circumstances is any attempt to be made to change the PGI gauge, Inductive gauge or any of the boards with the power on. The system must be completely powered down before changing components.**
- **When handling any of the boards, full Static Sensitive Handling procedures are to be observed, ie use of apprpriate personnel earthing straps, etc.**

Appendix 1

Roundness Glossary of terms

A

A-D converter

Analogue to digital converter which is used on the analogue output of the transducer to create Data Points.

Amplitude Distribution

The distribution of frequency with which peaks of the same height occur in the measured profile data.

Analogue

Faithful representation of the changing states of something in the real world. The essence of analogue representation is that the measurement value is continuously variable, usually between known limits. The output from a transducer is analogue. An analogue signal is converted to digital in an A-D converter.

Analysis

Analysis of roundness, straightness, flatness, cylindricity etc. Analysis comprises form fit, form removal, filtering and parameters.

Analysis View

One of two graphical presentations of the output. The other is Data Selection View.

Angle

The angle between 0 degrees position of the spindle and the line joining the centre of the reference circle to the datum axis

Arcuate Correction

The correction applied to the output from the transducer to compensate for the fact that the stylus (whose arm is pivoted) moves in an arc rather than a straight line.

Axis

Term used to refer to part of the instrument, such as the column and that defines a movement or measurement direction.

Axis Calibration

The action of specifying to the software the positions at which the traverse unit and column carriage are regarded as being located. This then provides a reference point on each axis for subsequent measurement or movement. The positions will normally be close to the physical positions (for example, the extreme left position of the traverse unit is nominally zero) but the reference will be precise; the physical position is not.

B

Balance

This term used to describe the resistive balance and phase characteristics that relate to the gauges.

Bandwidth

Specifies the ratio of the low pass cut-off to the high pass cut-off and represents the range of wavelengths that will remain after the filtering process

C

Calibration

A generic term which, in terms of roundness metrology, embraces axis calibration and gauge calibration.

Calibration Standard

A test surface having known values.

Coefficient

A mathematical term which is generated within the software during calibration of the gauge. It is these coefficients that are used together to describe the Calibration Constants of the gauge or system, which are then applied to the data to correct for systematic errors.

Component

A generic term to describe the item under test. The software is structured in such a way that configuration and programs can be saved in a way related to a particular component.

Concentricity

Concentricity is twice the eccentricity. This represents the diameter of the circle represented by the locus of the centre of the

selected reference figure rotating about the selected datum (axis point).

Contact Direction

See Gauge Orientation.

Co-ordinate System

A frame of reference which defines the datum from which a movement is measured in each measurement axis. It provides a notation for representing the locations of data points on a profile. Ultra Software supports 2 co-ordinate systems: Fiducial Co-ordinate System and User Co-ordinate System (UCS). Both systems use the same axes and the only difference between one and another is in terms of offsets and reversal factor. The software will carry out the transformation from any co-ordinate system to any other.

Crowning (cresting)

The action of finding the highest point on a convex, or lowest point on a concave surface. It is also applied to the alignment of the stylus of a roundness-measuring instrument to the spindle axis of the instrument.

Cut-off

In basic terms, a cut-off is a filter and is used as a means of separating or filtering the wavelengths of a component. Cut-offs have a numerical value that when selected will reduce or remove the unwanted wavelengths on the surface.

Cut-off Length

The numerical value of the Cut-off or Filter that is selected.

Cylindricity

Cylindricity is the amount by which a measured part departs from a perfect cylinder. When analysing cylindricity, there are four reference systems:

- Least Squares Cylinder
- Minimum Zone Reference Cylinder
- Minimum Circumscribed Cylinder
- Maximum Inscribed Cylinder

Further cylindricity measurements can be made using the first measurement as a reference to obtain:

- Concentricity
- Coaxiality

D

Data Collection

The term used to describe the action of drawing the stylus across the component. (The term "measurement" can be ambiguous and is not normally used unqualified).

Data Density

The chosen number of Data Points from the total available from the data collection process used in the display on the data selection view. This will be all, or a subset of points, the reductions being a simple matter of taking every Nth point regardless of the nature of the profile.(e.g. every 50th Point)

Data Length

The distance over which the stylus is drawn while data collection is taking place. Data Length does not include Run-up Length. The

use of filters reduces data length down to assessment length. It is, arithmetically, the sampling length or cut-off length times the number of cut-offs used in the measurement.

Data Point

A point on the analogue representation of the surface contour which has been sampled by the A-D converter and, consequently, had its position in space recorded by having co-ordinates allocated to it.

Data Selection Layout

A customised report and screen format. One Data Selection Layout accommodates one Data Selection View.

Datum

A fixed reference, to which the displacements of the stylus are referred. An independent straight datum is embodied in the column and arm of some instruments. The spindle axis is also a datum.

Data Selection View

A graphic item, contained with a Data Selection Layout, which provides facilities for visualising and interacting with a representation of a full measurement profile.

Device Control Dialog

A dialog which enables you to move the traverse unit, gauge, motorised y table, etc.

E

Eccentricity

Eccentricity is the term used to describe the position of the center of a profile relative to some datum point. It is a vector quantity in that it has magnitude and direction. The magnitude of the eccentricity is expressed simply as the distance between the datum point and profile center. The direction is expressed as simply as an angle from the datum point to the profile center.

Evaluation Length

A term which means the same as Data Length.

Exclude

Can refer to either Auto Scaling Exclude or Form Fit Exclude. Allows the user to ignore selected areas of data when the chosen operation or view is applied. The preferred term is Excluded Region.

Extend

Movement of the traverse unit to the left. Data collection cannot be carried out while extending, only while retracting.

F

Fiducial Co-ordinate System

One of the co-ordinate systems supported. The Fiducial Coordinate System may be regarded as the co-ordinate system which is "native" to the instrument; the others are derived from it. For the system to be valid, axis calibration must have been carried out.

Filter

An Electronic or Mathematical method or algorithm which separates out different wavelengths in the raw data and allows us to see only the wavelengths we are interested in. Usually filters have different settings for specific purposes and are specified in standards.

Flatness

Flatness is the distance separating two parallel planes which just enclose the profile under consideration. Flatness can be defined to the least squares or minimum zone references.

Least squares reference. A plane is fitted such that the sum of the squares of the deviations of the measured profile data points is minimised.

Minimum zone reference . Two parallel planes are fitted to the measured profiles such that they totally enclose the profile with minimum separation

G

Gauge

Mechanical assembly comprising the transducer, a pivoting mechanism to allow the stylus to move within its stylus range and an electrical connection.

Gauge Calibration

The measurement of an appropriate calibration standard to enable the software to derive a set of calibration constants which are applicable to a particular data collection session.

Gauge Orientation

Whether the stylus is pressing INTERNAL/EXTERNAL, UP or DOWN on the component. A gauge orientation of NORMAL is pressing DOWN, INVERTED is pressing UP. The gauge is constructed such that, when pressing UP, the stylus exerts the same force on the component as when pressing DOWN. Also known as Contact Direction.

Gauge Range

The total amount of distance that the stylus can move while staying in it useable mode. Going over this range will cause a gauge over-range message to be displayed. Going under the range will give no output signal.

Gauge Resolution

The smallest movement which the instrument can detect.

H

What is a Harmonic?

A harmonic is a repeated undulation in 360°. For example a third harmonic has 3 undulations of equal wavelength in 360°. Any surface can be broken down into its individual harmonic elements. The ability to analyse harmonics is very useful in order to predict a component's function or to control the process by which the component is manufactured.

I

Include

To "put back" part of a region of a data selection view which has previously been excluded.

Inductive

The type of transducer that is housed within a gauge and converts the movements of the stylus into electrical signals. An inductive transducer employs the very small movements of the stylus to move an armature between two coils to change their relative electrical inductance. The amplitude and direction of these changes provide the output from the gauge.

Instrument

The overall term used to describe the complete structure and collection of devices that make up a working unit.

J

K

L

Layout

The user-configurable graphical facility which acts as "host" to Data Selection View, or Analysis View.- LAYOUTS

Layouts are organised into a page layout which comprises a header and a footer with a view layout in the middle. The view layout

consists of information such as a raw profile view or the roughness analysis parameters.

Lc Cut-off

One of the two Cut-off wavelengths used in the system. Lc Cut-off has the longer wavelength and, in earlier metrology, was the only Cut-off value used.

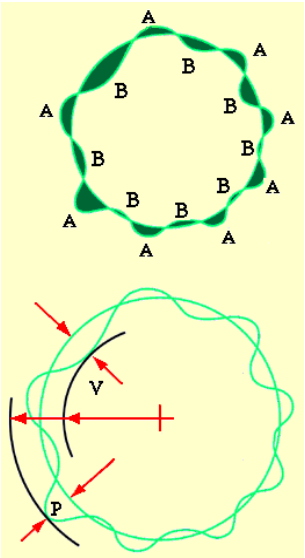
The Lc Cut-off specifies the high pass cut-off length for the selected filter. Wavelengths longer than this length will be reduced by the filtering process.

See also Ls Cut-off and bandwidth.

Least Squares Reference Circle (LSCI)

The least squares reference circle is calculated to be a circle fitted through the data such that the sum of the squares of the deviations inside and outside that circle is at a minimum. This circle is the most commonly used of the references.

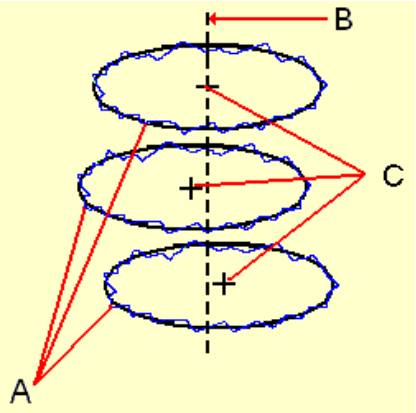
P = Highest Peak, V = Lowest Valley



Least Squares Reference Cylinder (LSCY)

The 'least squares cylinder' is calculated, by taking the centres of the least squares circle of each of the measured profiles selected to take part in the axis calculation.

The axis of the cylinder is the least squares straight line through these centres



A = Measured Profiles, B = Cylinder Axis, C = LS Centres

Ls Cut-off

One of the two Cut-off wavelengths used in the system. Ls Cut-off has the shorter wavelength.

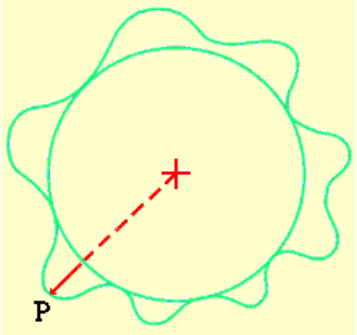
The Ls Cut-off specifies the low pass cut-off length for the selected filter. Wavelengths shorter than this length will be reduced by the filter process.

See also Lc Cut-off and bandwidth.

M

Maximum Inscribed Reference Circle (MICI)

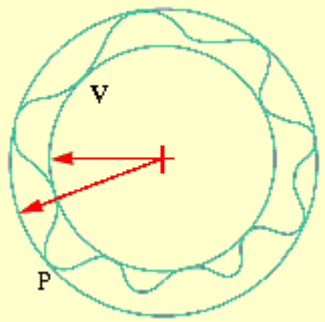
The Maximum Inscribed reference circle is the largest circle that is totally enclosed by the data.



P = Out of Roundness

Minimum Zone Reference Circles (MZCI)

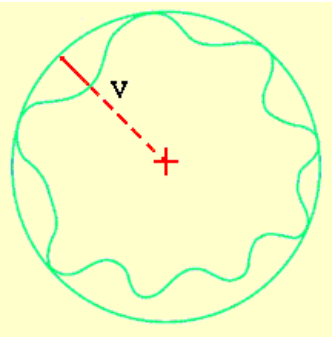
The Minimum Zone reference circles are two concentric circles, positioned to totally enclose the data, such that the radial separation between them is a minimum.



P = Highest Peak, V = Lowest Valley

Minimum Circumscribed Reference Circle (MCCI)

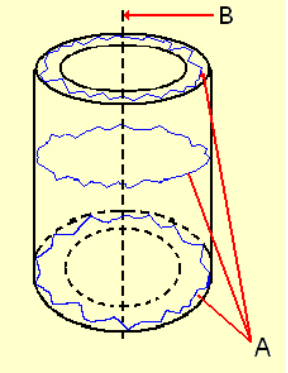
The Minimum Circumscribed reference circle is the smallest circle that totally encloses the data.



V = Out of Roundness

Minimum Zone Reference Cylinder (MZCY)

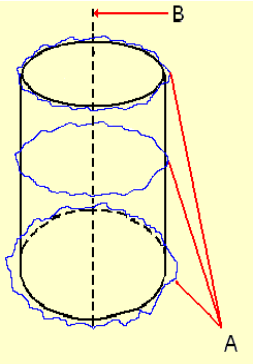
The minimum zone cylinder is calculated by processing the selected number of data points in each of the measured profiles selected, to define the cylinder axis. Two co-axial cylinders are fitted to the measured profiles. The diameters of these cylinders, and their orientation, are adjusted to obtain the minimum separation that totally encloses the measured profiles.



A = Measured Profiles, B = Cylinder Axis

Maximum Inscribed Reference Cylinder (MICY)

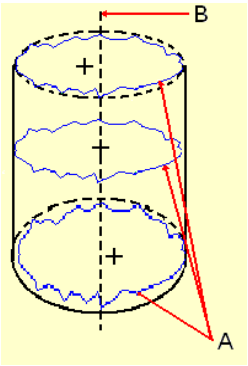
This is calculated by processing the selected number of data points in each of the measured profiles selected to define the cylinder axis and then fitting a cylinder to these profiles such that it is the largest diameter cylinder that is totally enclosed by them.



A = Measured Profiles, B = Cylinder Axis

Minimum Circumscribed Reference Cylinder (MCCY)

This is calculated by processing the selected number of data points in each of the measured profiles selected to define the cylinder axis and then fitting a cylinder to these profiles such that it is the smallest diameter cylinder that totally encloses the measured profiles



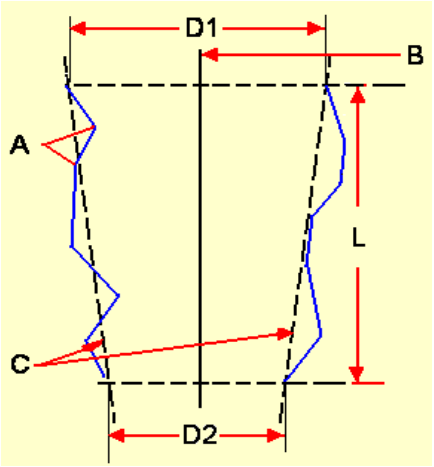
A = Measured Profiles, B = Cylinder Axis

Other Cylindricity Definitions

Cylinder Peak to Valley. This is calculated after the computation of the reference axis.

Cylinder Parallelism. A selected 'slice plane' is constructed which lies on the defined axis of the cylinder at a user chosen orientation. A least squares straight line is constructed through all of the profile data points that intersect this plane on one side of the cylinder axis. Similarly, a second least squares line is constructed through all of the profile data points intersecting this plane on the opposite side of the axis. The cylinder parallelism at this orienta-

tion is the difference between the separations of these two lines at the highest and lowest defined measured planes.



A = Data Points
B = Cylinder Axis
C = LS Straight Lines
L = Cylinder Length
D1 = Diameter of LS Lines at the top of the Cylinder
D2 = Diameter of LS Lines at the bottom of the Cylinder
Cylinder Parallelism = D1 – D2

If the separation at the top is larger than at the bottom of the cylinder, the value given is positive. If the separation of the top is smaller than at the bottom of the cylinder, the value given is negative

Note that for interrupted profiles out of range data points are ignored in the calculations.

The position of the selected slice plane through the cylinder is given as an angular value on the cylinder display page.

Cone Angle. The analysis takes the upper and lower planes of those selected for cylindricity analysis. A Least Squares circle is fitted to each plane and the cone angle is calculated from their radii and separation.

$$ConeAngle = 2xa\tan\left\{\frac{R1-R2}{Z1-Z2}\right\}$$

Where R = Radius and Z = Separation

Maximum Cylinder Parallelism. This is the maximum of the cylinder parallelism values. The angle of the slice plane orientation where this occurs is also given.

Note that the reference cylinder and cylinder axis are calculated only from the measured profiles selected to define the axis.

Coaxiality. This is assessed with a choice of either the ISO (ISO 1101) or DIN (DIN 7184) definitions.

The coaxiality value (ISO) is determined by the diameter of a cylinder that is coaxial with the datum axis and will just enclose the axis of the cylinder referred for coaxiality evaluation.

The coaxiality value (DIN) is determined by the diameter of a cylinder that is coaxial with the datum axis and will just enclose the centroids of the planes from which the axis of the cylinder referred for coaxiality evaluation is calculated.

Z Height. Is the height of measurement relative to component base, or selected datum.

Total Runout. Is the highest runout value from a series of measurements

Measurement Length

A term which means the same as Data Length.

Movement Speed

The speed at which a device moves when commanded to do so. See also Contact Speed. See also Measurement Speed.

N

O

Off-line

A facility to write or edit a program without the instrument responding in real time to the commands issued.

Offset

A value which is added to, or subtracted from, a measurement in one or more axis to convert from one co-ordinate system to another.

Origin

The point which is regarded, by definition, at being 0,0 in terms of co-ordinates. The only co-ordinates quoted in this context are x and z (the measurement axes). The Y axis does not, at present, have co-ordinates assigned and tilt is expressed only in terms of degrees from the horizontal.

P

Parallelism

Parallelism is the distance between two parallel lines or planes that are parallel to the datum feature and just enclose the profile under consideration. Parallelism can be defined to the least squares or minimum zone references.

Least squares reference. A datum line is constructed using one straightness profile, by fitting a least squares straight line or a minimum zone pair of straight lines. A least squares straight line is then constructed from the second straightness profile.

The parallelism value is the difference in the separation of the datum line and the second least squares line over the length of the straightness profiles.

Minimum zone reference . The datum line is constructed from the first straightness profile, as for least squares parallelism. The parallelism value is the minimum separation of two straight lines, which are parallel to the datum line and totally enclose the second straightness profile.

Parameter

The set of values used in surface metrology to describe the texture of a surface in quantitative terms.

Profile

The trace of the component. It is stored digitally in terms of data points.

Program

The sequence of instruction which the user of the instrument can pre-record. The program can be prepared and edited off-line.

Program Status

Either on-line or off-line.

Q

Qualifier

The optional variable(s) used in the calculation of a parameter.

R

Radius

This value is dependent on the calibration of the radial arm (which is a visual scale reading), and is for reference only, unless calibrated to a plug or ring gauge of known size.

Range

see Gauge Range

Raw Profile

A term often used which means broadly the same as Primary Data. Also known as Raw Data.

Resolution

see Gauge Resolution

Retracting

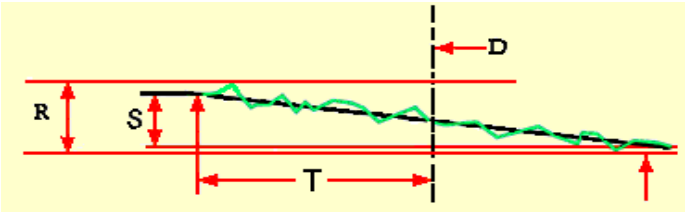
Stylus movement from left to right. Data collection must take place only while the stylus is retracting in order to avoid the effect of backlash in the mechanism and also to prevent the stylus from digging in to the component. The opposite of retract is extend.

Runout

The radial separation of two concentric circles, which themselves are concentric to the datum axis (or point), and totally enclose the measured profile, i.e. totalindicator reading. (ISO 1101; DIN 7184;BS.308 pt3.)

Runout Axial Measurement

This is the minimum axial separation of two parallel planes, which are themselves normal to the reference axis, and which totally enclose the measured profile. ISO 1101; DIN 7184; BS 308 pt3).



D = Datum Axis, R = Runout, S = Reference Plane Squareness, T = Radius of Measurement

Run-up Length

The amount of travel allowed for the traverse mechanism to stabilise before data collection begins. Run-up Length is the only difference in value between Data Length and Traverse Length.

S

Sampling Length

A term which has different meanings in different contexts. For a primary profile it is equal to the data length. For roughness and waviness analysis it is equal to the selected Lc Cut-off wavelength. Also known as Cut-off Length.

Selected

That part of a profile in Data Selection View which is marked to be used in analysis. The preferred term to describe that part of the data which is selected is the "selected area". The end of the profile which are not selected are displayed on a cross-hatched background (default colour is grey).

Squareness

The `reference plane squareness' value, is the minimum axial separation of two parallel planes which are normal to the reference axis and totally enclose the L.S. reference plane fitted to the data.

Straightness

There are two methods of analysing straightness:

One method involves fitting a **Least Squares Reference** line to the surface so that the areas above and below the reference line are equal and kept to a minimum separation. Straightness can be quantified as the highest peak to the lowest valley normal to the Least Squares reference line.

Another method involves fitting two parallel lines that totally enclose the data and are kept to a minimum separation. Straight-

ness is quantified as the separation of the two lines. This is the **Minimum Zone Reference** method of calculation.

Stylus

The probe used to contact and follow the test surface when gathering data. Usually a diamond tip for surface finish measurement or a ball tip for form only measurement.

T

Total Runout

Is the maximum deviation from a combined series of measurements as opposed to Runout which is taken from a single measurement or plane.As such the maximum positive deviation may come from a different measurement or plane than the maximum negative deviation.

Transducer

The device which converts stylus movement to an electrical (analogue) signal. The analogue signal is converted to digital in an A-D converter.

Transformation

A set of three offset values and a reversal factor which, used together, convert from one Co-ordinate System to another.

U

UCS

User Co-ordinate System. One of co-ordinate systems supported. With this system, the user sets the axis positions (these are stored as offsets from the ICS positions).

V

View

See Data Selection View and Analysis View

W

Wavelength

The distance between corresponding features of a substantially repetitive profile.

X

Y

Z

Z Height

Is the height of measurement relative to component base, or selected datum.

Appendix 2
Surface Glossary of Terms

A

Amplitude Distribution

The distribution of frequency with which peaks of the same height occur in the measured profile data.

Analysis

Can refer to Primary Analysis or analysis of Roughness, Waviness etc. Analysis comprises form fit, form removal, filtering and parameter calculation.

Analysis View

One of two graphical presentations of the output. Analysis View is the presentation of the results of an analysis. typically this might contain both graphical and textual information. The other is Data Selection View.

Arcuate Correction

The correction applied to the output from the transducer to compensate for the fact that the stylus (whose arm is pivoted) moves in an arc rather than a straight line.

Assessment Length

That part of the profile which remains after the various filters have removed sampling lengths (or parts thereof) from either end of the data length.

Auto Lift-off

A facility to lift the stylus away from the component at the end a data collection pass. Also known as Move Z After Measure.

Auto Reverse

A facility to re-position the stylus at the start position automatically after a data collection pass. It does not automatically repeat the pass.

Auto Scaling Exclude

Marking of those parts of a profile on a view which are not to be used in the auto-scaling of the view to fit the available screen space. Auto Scaling Excluded regions of a profile are displayed as a dotted line.

Axis

Axis describes any of the directions of motion of the metrology system.

Axis Calibration

The action of specifying to the software the positions at which the traverse unit and column carriage are regarded as being located. This then provides a reference point on each axis for subsequent measurement or movement. The positions will normally be close to the physical positions (for example, the extreme left position of the traverse unit is nominally zero) but the reference will be precise; the physical position is not.

B

Bandwidth

The ratio between the wavelengths of the Lc Cut-off and Ls Cut-off values.

Specifies the ratio of the low pass cut-off to the high pass cut-off and represents the range of wavelengths that will remain after the filtering process

Bearing Ratio

Also known as Material Ratio (Rmr) is the length of material surface (expressed as a percentage of the evaluation length L) at a depth (d) below a reference level (c) . It is used to help predict wear processes.

C

Calibration

A generic term which, in terms of surface metrology, embraces axis calibration and gauge calibration.

Calibration Constant

A numerical value that represents some physical property of the system as determined by the calibration procedure.

Calibration Standard

A test surface having known values.

Component

A generic term to describe the item under test. The software is structured in such a way that configuration and programs can be saved in a way related to a particular component.

Constant

See Calibration Constant

Contact Direction

See Gauge Orientation.

Contact Speed

The speed at which the column carriage moves when commanded to move into contact with the component.

Co-ordinate System

A frame of reference which defines the datum from which a movement is measured in each measurement axis. It provides a notation for representing the locations of data points on a profile. Ultra Software supports the following co-ordinate systems: Fiducial Co-ordinate System and User Co-ordinate System (UCS). Both use the same axes and the only difference between one and another is in terms of offsets and reversal factor. The software will carry out the transformation from any co-ordinate system to any other.

Cresting

For surface measurement, cresting is the process of determining the highest point of a component that has a convex form, or the lowest point of a concave form. This is normally an iterative process in which the stylus is traversed over the component a number of times until the position of the turning point is established. The stylus is then automatically positioned at this point on the component.

Cut-off

In basic terms, a cut-off is a filter and is used as a means of separating or filtering the wavelengths of a component. Cut-offs have a numerical value that when selected will reduce or remove the unwanted wavelengths on the surface. For example, a roughness filter cut-off with a numeric value of 0.8mm will allow wave-

lengths below 0.8mm to be assessed with wavelengths above 0.8mm being reduced in amplitude; the greater the wavelength, the more severe the reduction. For a waviness filter cut-off with a numeric value of 0.8mm, wavelengths above 0.8mm will be assessed with wavelengths below 0.8mm being reduced in amplitude.

Cut-off Length

The numerical value of the Cut-off or Filter that is selected.

D

Data Collection

The term used to describe the action of drawing the stylus across the component. (The term “measurement” can be ambiguous and is not normally used unqualified).

Data Density

The chosen number of Data Points from the total available from the data collection process used in the display on the data selection view.(e.g. 120,000) This will be all, or a subset of points, the reductions being a simple matter of taking every Nth point regardless of the nature of the profile.(e.g. every 50th Point).

Data Length

The distance over which the stylus is drawn while data collection is taking place. Data Length does not include Run-up Length. The use of filters reduces data length down to assessment length.

Data Point

One of the sampled points within the profile.

Data Selection Layout

A customised report and screen format. One Data Selection Layout accommodates one Data Selection View.

Datum

A fixed reference, to which the displacements of the stylus are referred. An independent straight datum is embodied in the Traverse Unit. This is referenced when skidless measurements are made. An alternative is to attach a nosepiece with a skid to the gauge. The skid then mechanically filters out waviness and form.

Data Selection View

A graphic item, contained with a Data Selection Layout, which provides facilities for visualising and interacting with a representation of a full measurement profile.

Desert Landscape

An analogy from nature which is often used to illustrate the concepts of roughness, waviness and form.

Device

An element which goes to form part of an instrument. Examples of elements would include the traverse unit, gauge, motorised y table, etc.

Device Control Dialog

A dialog which enables you to move the traverse unit, gauge, motorised y table, etc.

E

EIM

Electronic Interface Module. The device which provides the interface between the instrument and the controlling computer.

Evaluation Length

Length of the profile that has been used for evaluating parameters.

Exclude

Can refer to either Auto Scaling Exclude or Form Fit Exclude. Allows the user to ignore selected areas of data when the chosen operation or view is applied. The preferred term is Excluded Region.

Extend

Movement of the traverse unit to the left. Data collection cannot be carried out while extending, only while retracting.

F

Filter

An Electronic or Mathematical method or algorithm which separates out different wavelengths in the raw data and allows us to see only the wavelengths we are interested in. Usually filters have different settings for specific purposes and are specified in standards.

Form

The overall “shape” of the object under test and the accuracy with which it conforms to a perfectly shaped conceptual model. In terms of the analogy with a desert landscape, form is the large undulations of hills and valleys.

Form Analysis

The calculation, carried out in the software, which creates a conceptual form fit (for example a straight line or an arc). It is the variation between this form fit and the real profile which enables parameters to be calculated.

Form Fit

A theoretical line or arc with which the real profile is compared.

Form Fit Exclude

Marking of those parts of a profile displayed in Data Selection View which are not to be used in calculation of the form fit. Form Fit Excluded regions on a view are displayed on a coloured background (the default is pink).

G

Gauge

Mechanical assembly comprising the transducer, a pivoting mechanism to allow the stylus to move within its stylus range and an electrical connection.

Gauge Calibration

The measurement of an appropriate calibration standard (radius, prism or 3-line) to enable the software to derive a set of calibration constants which are applicable to a particular data collection session.

Gauge Orientation

Whether the stylus is pressing UP or DOWN on the component. A gauge orientation of NORMAL is pressing DOWN, INVERTED is pressing UP. The gauge is constructed such that, when pressing UP, the stylus exerts the same force on the component as when pressing DOWN. Also known as Contact Direction.

Gauge Range

The total amount of distance that the stylus can move while staying in it useable mode. Going over this range will cause a gauge over-range message to be displayed. Going under the range will give no output signal.

Gauge Resolution

The smallest movement which the instrument can detect.

H

Hinge

The connection between the transducer and the stem on some systems. It can be set to be either rigid or, if the nosepiece is fitted, set to be loose.

I

ICS

Instrument Co-ordinate System. One of the co-ordinate systems supported. The ICS may be regarded as the co-ordinate system which is “native” to the instrument; the others are derived from it. For the ICS to be valid, axis calibration must have been carried out.

Include

To “put back” part of a region of a data selection view which has previously been excluded.

Inductive

The type of transducer that is housed within a gauge and converts the movements of the stylus into electrical signals. An inductive transducer employs the very small movements of the stylus to move an armature between two coils to change their relative electrical inductance. The amplitude and direction of these changes provide the output from the gauge.

Interferometric

The application of interferometery (application of light wave interference phenomena for measurement purposes).

Instrument

The overall term used to describe the complete structure and collection of devices that make up a working unit.

J

K

L

Layout

The user-configurable graphical facility which acts as “host” to Data Selection View, or Analysis View.

Types of Layout

Layouts are organised into a page layout which comprises a header and a footer with a view layout in the middle. The view layout consists of information such as a raw profile view or a roughness analysis parameter panel.

Lc Cut-off

One of the two Cut-off wavelengths used in the system. Lc Cut-off has the longer wavelength and, in earlier metrology, was the only Cut-off value used.

The Lc Cut-off specifies the high pass cut-off length for the selected filter. Wavelengths longer than this length will be reduced by the filtering process.

See also Ls Cut-off and bandwidth.

Length

An ambiguous term when used unqualified. See Assessment Length, Cut-off Length, Data Length, Evaluation Length, Measurement Length, Sampling Length, Run-up Length, Traverse Length.

Ls Cut-off

The Ls Cut-off specifies the low pass cut-off length for the selected filter. Wavelengths shorter than this length will be reduced by the filter process.

See also Lc Cut-off and bandwidth.

M

Manipulation Axes

The axes from which measurements are not taken (the tilt and y axes) but which are used to position the component.

Material Ratio

Also known as Bearing Ratio is the length of material surface (expressed as a percentage of the evaluation length L) at a depth (d) below a reference level (c) . It is used to help predict wear processes.

Measurement Axes

The axes from which measurements are taken (x and z axes) and used in the computation. See also Manipulation axes.

Measurement Length

A term which means the same as Data Length.

Measurement Loop

The physical connection between the structural elements of the instrument which provide the physical reference against which the movement of the stylus is measured. Unless the nosepiece is fitted, the measurement loop will typically comprise the transducer, stem, carriage, column, base, clamp and component and all the connections between them.

Measurement Speed

The speed at which the traverse unit moves during data collection. See also Movement Speed.

Modified Profile

Profile resulting from applying some operations, eg form removal and filtering, to the raw profile.

Movement Speed

The speed at which a device moves when commanded to do so. See also Contact Speed. See also Measurement Speed.

N

Nosepiece

A small metal attachment which can be fitted to the transducer on some instruments,to reduce the measurement loop. When fitted, the hinge must be loosened and the skid on the nosepiece maintains contact with the component.

O

Off-line

A facility to write or edit a program without the instrument responding in real time to the commands issued.

Offset

A value which is added to, or subtracted from, a measurement in one or more axis to convert from one co-ordinate system to another.

Origin

The point which is regarded, by definition, at being 0,0 in terms of co-ordinates. The only co-ordinates quoted in this context are x and z (the measurement axes). The Y axis does not, at present, have co-ordinates assigned and tilt is expressed only in terms of degrees from the horizontal.

P

Parameter

The set of values used in surface metrology to describe the texture of a surface in quantitative terms.

PGI

Phase Grating Interferometric transducer. This device is housed within a gauge and converts the movements of the stylus into an electrical signal. This type of transducer employs a laser diode in conjunction with a fine optical grating to detect very small movements of the stylus and provides a high resolution output of both amplitude and direction.

Pitch

The “straight line” (or Euclidean) distance between the origin and the crosshair cursor position on the data selection view.

Primary Analysis

Analysis which takes primary data as its input, carries out form fit, primary filtering and calculates primary parameters. The output from primary analysis is called the Modified Profile.

Primary Profile

This is the profile from which the Primary parameters are calculated. The Primary Profile is obtained from the raw profile by means of form removal and filtering.

Primary Filter

The primary filter is also known as the ‘Lambda s’ (λs or Ls) filter. The filter is used to supress very short wavelengths that are considered to be of no consequence to the analysis, ie noise. By specifying a Lambdaa s filter, primary analysis results between different instrument types made under similar conditions should be comparable.

Primary Parameters

Surface finish parameters calculated from the primary profile.

Profile

The trace of the component. It is stored digitally in terms data points.

Program

A sequence of instructions recorded by a user so that they can be replayed later.

Q

Qualifier

A setting used to define how certain parameters are calculated.

R

Range

see Gauge Range

Raw Profile

The profile obtained directly from a measuremnet prior to the application of any form removal or filtering process..

Reset

This is a software facility that applies only to the PGI gauge and is used to align the true gauge position with the gauge read-out.

Note. The gauge must be hanging in free air and not resting on any surface or stylus stop attachment when the reset command is given.

Resolution

see Gauge Resolution

Retracting

Stylus movement from left to right. Data collection must take place only while the stylus is retracting in order to avoid the effect of backlash in the mechanism and also to prevent the stylus from digging in to the component. The opposite of retract is extend.

Roughness

The microscopic ridges by which the surface differs from a perfectly smooth line or plane. It is described in terms of the wavelength of the profile. In terms of the analogy with a desert landscape, roughness is the grains of sand.

Roughness Filter

An Electronic or Mathematical method or algorithm which separates out longer wavelengths in the raw data and allows us to see only the wavelengths we are interested in that is, it removes waviness.

Run-up Length

The amount of travel allowed for the traverse mechanism to stabilise before data collection begins.

S

Sampling Length

A term which has different meanings in different contexts. For a primary profile it is equal to the data length. For roughness and waviness analysis it is equal to the selected Lc Cut-off wavelength. Also known as Cut-off Length.

Selected

That part of a profile in Data Selection View which is marked to be used in analysis. The preferred term to describe that part of the

data which is selected is the “selected area”. The end of the profile which are not selected are displayed on a cross-hatched background (default colour is grey).

Skid

The small polished lug on the end of the nosepiece which maintains contact with the component. Usually used on instruments that have no independent or internal reference system.

Speed

See Contact Speed, Move Speed

Stylus

The probe used to contact and follow the test surface when gathering data. Usually a diamond tip for surface finish measurement or a ball tip for form only measurement.

Surface Texture

See Texture

T

Texture

The generic terms which includes roughness, waviness and form. It is conveniently described by analogy with a desert landscape.

Tilt Adaptor

A mechanical piece which enables the traverse unit to be mounted at 15º, 30º or 45º to the horizontal and to have its rotation controlled with respect to this angle. The angle of the adaptor does not need to be known precisely because tilt is a manipulation axis, not a measurement axis.

Tilt Axis

The axis on which the traverse unit can be rotated to accommodate a slight gradient in the component. Limited to ±8°. The + direction is anticlockwise. Calibration of the tilt axis is fixed a 0° (that is, parallel to the base, unless a tilt adaptor is fitted).

Transducer

The device which converts stylus movement to an electrical (analogue) signal.

Transformation

A set of three offset values and a reversal factor which, used together, convert from one Co-ordinate System to another.

Traverse Length

The full distance over which the stylus is drawn for a data collection operation.

Traverse Unit

The drive unit which moves the stylus in the x axis.

U

UCS

User Co-ordinate System. One of co-ordinate systems supported. With this system, the user sets the axis positions (these are stored as offsets from the ICS positions).

V

View

See Data Selection View and Analysis View

W

Waviness

Undulations which are larger than roughness but smaller than the shape called “form”. It is described in terms of the wavelength of the profile. In terms of the analogy with a desert landscape, waviness is the ripples in the sand.

Waviness Filter

A filter which reduces shorter wavelengths (that is, removes roughness).

Wavelength

The distance between corresponding features of a substantially repetitive profile.

X

Y

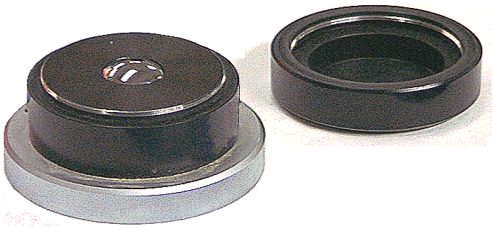
Z

Appendix 3
CALIBRATION STANDARDS

There are two Calibration Standards; the Calibration Ball and the Three-Line Calibration Standard.

Calibration Ball

The standard comprises a highly polished precision Ball, with housing and screw-on cap. The application of this standard is described in Calibration.



The calibration standard used should be appropriate to the pick-up and stylus type.

- For use on 60mm long stylus arms: Precision ball nominally 25mm diameter
- For use on 120mm long stylus arms: Ball nominally 44mm diameter

Note. The calibrated size of each individual standard is shown on two labels. One label is located under the base of the standard and the other on the inside of the screw-on cap. Therefore, if more than one standard has been supplied, it is important to ensure that the screw-on caps are not interchanged. This could lead to the use of an incorrect radius when calibrating. In which case, subse-

quent measurement results would be invalid until the instrument was re-calibrated using the correct radius value.

Turning the Ball

If damage (e.g. scratches etc.) has occurred to the calibration ball and difficulty is experienced in obtaining a suitable calibration, then it is advisable to rotate the ball to present an undamaged surface area. This can be done as follows:

1.Ensure that the cap is firmly screwed in position.

2.Using a small screwdriver remove the plastic cover from the base of the housing to reveal three socket head screws (3mm).

3.Loosen the screws but do not remove them.

4.Gently lift up the black housing from its base to break the seal of the 'O' ring on the ball.

5Turn the ball to a new, undamaged position.

6.Tighten the three socket head screws and replace the plastic cover.

Cleaning

The standard should be cleaned using a non-staining solvent such as Methanol AR (CH3OH) on a lint free cloth or a lens tissue. Alternatively, any commercially available lens cleaning liquid can be used.

Caution. DO NOT use any form of abrasive cleaner.

Three Line Calibration Standard

The Three-Line Calibration Standard, for use with the Form Talysurf Intra instrument consists of a frame and base on which are mounted two glass plates.

The label below the left hand glass plate has a rectangle marked on it two rectangles. The rectangles denote the areas in which three lines (actually grooves) are located. These are nominally 2.5mm (100min) and 0.4mm (15min) deep. The label below the right hand glass plate has a single rectangle marked on it, this rectangle denotes the area in which a further three lines are located. These are nominally 0.025mm (1min) deep. The values of the middle line of each group are marked on the standard. The serial number of the NAMAS certificate for this standard is marked in this area when relevant.

Three Line and Ra Calibration Standard

The Three Line and Ra Calibration Standard, for use with the Form Talysurf Intra instrument consists of a frame and base on which are mounted two glass plates.

This standard is used for the calibration of the vertical displacement of the stylus and provides a confidence check for the Ra parameter. The label below the left hand glass plate has marked on it two rectangles separated by a black bar. The rectangles denote the areas in which three lines (actually grooves) are located. These are nominally 2.5mm (100min) and 0.40mm (16min) deep.

The value of the middle line is marked on the standard. The label below the right hand glass plate has marked on it a rectangle with two arrows. The rectangle denotes an area of the glass plate that is etched to a calibrated Ra value - nominally 0.8mm (31.5min) The arrows indicate the direction in which calibration measurements should made.

Cleaning of the three-line standard

The standard should be cleaned using a non-staining solvent such as Methanol AR * on a lint free cloth or a lens tissue. Alternatively, any commercially available lens cleaning liquid